

# Dental Dam and Isovac Usage: Factors Influencing Dental Students' Decisions on Isolation Techniques

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*Abstract:* The Isovac system was introduced into the Virginia Commonwealth University dental curriculum with the intention that it would be used as a substitute when the dental dam could not be placed. The aim of this study was to determine the usage and factors that influenced dental students' decisions to use the dental dam or Isovac. All third- and fourth-year dental students (n=210) were asked in 2017 to complete a 26-item survey. The survey asked about students' operative procedures completed using the dental dam and Isovac, their own and their patients' preferences, basic dental dam knowledge, full-time and adjunct faculty recommendations of method, importance of factors influencing their decisions, and anticipated dental dam use after graduation. Comments were also allowed. A total of 164 students responded to the survey, for a 78% response rate. Of the respondents, 58% said they used the Isovac only when they could not use the dental dam. Among the eight general practice groups in which students are educated in delivery of comprehensive dental care, preference was significantly different for placement of Class II restorations. Overall, the students' dental dam knowledge was low, and the knowledge results were not associated with its use. According to the students, recommendations by full-time and adjunct faculty members were significantly different. Factors ranked by importance from greatest to least for determining which isolation method to use were as follows: moisture control, procedure, patient comfort, application time, ease of placement, and attending faculty. Student comments overwhelmingly favored dental dam usage if a dental assistant was available. This study found that dental dam and Isovac use was not standardized among the general practice groups and faculty. Student education, faculty calibration, and increased use of trained dental assistants are required to ensure education is consistent among all general practice groups.

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The dental dam has been the primary method taught in dental schools to provide an isolated operative field since its introduction by Barnum in 1886.<sup>1,2</sup> Advantages of the dental dam include all of the following: improved access and field of vision, moisture control, minimization of aerosols, retraction and protection of soft tissues, patient safety, increased efficiency, and improved patient management.<sup>1-6</sup> With increased demand for esthetic dentistry, the dental dam is considered by many to be essential for modern adhesive dentistry.<sup>7-9</sup> For many educators, the dental dam is the standard of care. Furthermore, the dental dam is required during every state and regional licensure board examination. However, soon after graduation, there is a precipitous decrease in the use of the dental dam. Surveys have confirmed this decrease with reported usage of less

than 20% for restorative dentistry and less than 63% for non-surgical endodontic procedures.<sup>10-15</sup> Gilbert and Litaker's study found that dental dam usage was only 12% during operative procedures and varied significantly by dentist, restoration type, and patient variables.<sup>14</sup> Reasons cited by dentists for not using the dental dam included the following: the dental dam is too time-consuming and cumbersome; it is disliked by patients; it is too costly; respondents felt they had insufficient training in its use; and they believed that it does not affect the quality of the restoration.<sup>10-15</sup>

In 2008, our school instituted the general practice model of educating predoctoral students in the delivery of comprehensive dental care. In their first year, students are randomly assigned to one of eight general practice groups (GPGs). Each GPG consists of 13 or 14 dental students from each class year. A

faculty member competent in comprehensive dentistry is assigned as group leader who reports to the chair of the Department of General Practice. Group leaders are responsible for ensuring each student obtains enough clinical experience to become competent as an entry-level general dentist upon graduation. All initial and periodic dental exams, treatment plans, operative dentistry, majority of fixed prosthodontics (excluding implant crowns), uncomplicated extractions, and patients with mild localized periodontitis are treated in the GPGs under the guidance of the group leaders and general dentists.

The graduating class of 2015 made a monetary pledge to the dental school earmarked for the purchase of Isovacs (Isolite Systems, Santa Barbara, CA, USA) to be used as an additional isolation method in the predoctoral clinics. The Isovac consists of a bite block, tongue shield, and a vacuum channel. The Isovac appliance purportedly creates an operative field free of contamination. It facilitates retraction of the cheek and tongue, and the bite block stabilizes opening of the mouth. Additionally, it simultaneously provides access for the dentist to two quadrants of the oral cavity. The manufacturer states the following advantages: easier and faster placement than the dental dam, improved patient comfort, and moisture control as efficient as the dental dam. The Isovac can be used for the same procedures that the dental dam is intended for: restorative dentistry, crown preparations, cementation of post and cores, and placing sealants. In addition, it can be used for scaling and root planing. The Department of General Practice's policy is that the dental dam will be the primary method for isolating the operative field, and the Isovac may be used only when the dental dam cannot be placed. However, our experience suggests that adherence to the policy is inconsistent. The aim of this study was thus to determine the usage and factors that influenced dental students' decisions to use the dental dam or Isovac.

## Methods

The Virginia Commonwealth University Institutional Review Board granted expedited approval for this study (IRB #HM20009400). Third-year (n=105) and fourth-year dental students (n=105) were asked to voluntarily complete a 26-item survey. Because the survey asked about patients' preferences, students were asked to complete the survey only if their patients had experienced both the dental dam and Isovac. This study pertained only to use of the dental dam in the GPGs and excluded dental dam use

in pediatric dentistry and endodontic procedures. The survey also allowed student comments.

Survey data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted by our university. When appropriate, differences between faculty type, student class, and GPG were compared using chi-squared tests based on raw numbers ( $p < 0.05$ ). Associations between dental dam knowledge (number of correct responses) and preferences for using the Isovac or dental dam were assessed using logistic regression ( $p < 0.05$ ). SAS Enterprise Guide v.6.1 (SAS Institute, Cary, NC, USA) was used for statistical analysis.

## Results

A total of 164 students responded to the survey, for a 78% response rate; 86 respondents were from the D3 class and 78 from the D4 class. There were 17 to 24 combined D3 and D4 respondents from each of the eight GPGs. The Isovac was used for all classes of restorations, placement of sealants, crown preparations, post and core placement, and scaling and root planing. Of the respondents, 58% (n=95) reported that they only used the Isovac when they could not use the dental dam. The difference on this item between D3 and D4 respondents was not statistically significant ( $X^2(1, n=161)=0.08; p=0.7735$ ).

The responding students' overall preference for using the dental dam was 42% (n=69). However, there was a statistically significant difference in preference across the eight GPGs ( $X^2(7, n=161)=17.32; p=0.0154$ ), which ranged from 17% to 63% (Table 1). Also, there were significant differences in preference depending on restoration classification (Table 2). Preferences did not differ significantly

**Table 1. Isolation preferences reported by students in eight general practice groups (GPGs)**

GPG	Dental Dam	Isovac
1	44%	56%
2	37%	63%
3	63%	37%
4	60%	40%
5	24%	76%
6	37%	63%
7	17%	83%
8	55%	45%
Overall	42%	58%

Note: The difference among the GPGs in preferred method of isolation was statistically significant:  $p=0.0154$ .

**Table 2. Frequency of isolation technique students reported using, by preparation type and general practice group (GPG)**

GPG	Class I			Class II		Class III		
	Dental Dam	Isovac	Neither	Dental Dam	Isovac	Dental Dam	Isovac	Neither
1	44%	56%	0	61%	39%	56%	44%	0
2	26%	74%	4%	37%	63%	47%	47%	6%
3	54%	42%	0	75%	25%	71%	21%	8%
4	55%	45%	0	70%	30%	55%	45%	5%
5	25%	75%	0	50%	50%	50%	44%	6%
6	28%	72%	0	50%	50%	56%	44%	0
7	17%	83%	0	30%	70%	35%	57%	9%
8	35%	65%	0	40%	60%	65%	30%	5%
p-value		0.2077		0.0222*		0.6522		

Note: No respondents chose "Neither" for Class II restorations.

\*Statistically significant

among the GPGs for Class I restorations ( $X^2(14, n=159)=17.98; p=0.2077$ ) or Class III restorations ( $X^2(14, n=160)=11.43; p=0.6522$ ), but were significant for Class II restorations ( $X^2(7, n=160)=16.34; p=0.0222$ ). Preferences did not differ significantly between third- and fourth-year students for Class I restorations ( $X^2(2, n=159)=3.99; p=0.1354$ ), Class II restorations ( $X^2(1, n=160)=2.56; p=0.1097$ ), or Class III restorations ( $X^2(2, n=160)=5.18; p=0.0751$ ). As their first choice for Class I restorations, 36% (n=57) selected the dental dam, 63% (n=100) the Isovac, and 1% (n=2) neither. As their first choice for Class II restorations, 51% (n=82) selected the dental dam, and 49% (n=78) the Isovac. As their first choice for Class III restorations, 54% (n=89) selected the dental dam, 41% (n=65) the Isovac, and 5% (n=8) neither. These differences were statistically significant ( $X^2(4, n=479)=24.99; p<0.0001$ ).

Overall, the students' dental dam knowledge was low with a mean number of correct answers of 1.9 (SD=1.17) (Table 3). Most respondents (80% for third-year and 87% for fourth-year) correctly identified the dental dam clamp intended for gingival retraction, but 45% or less responded correctly to each of the remaining questions. There was a significant difference between D3 and D4 students for the question regarding the meaning of a "W" on a dental dam clamp with 45% of D3 students (n=39) and 25% of D4 students (n=19) responding correctly ( $X^2(1, n=163)=7.56; p=0.0059$ ). The differences for the remaining questions were not statistically significant. However, the students' knowledge of the dental dam was not associated with increased usage (1.03; 95% CI=0.79, 1.35). Students who answered more knowledge questions correctly did not necessarily use the dental dam more frequently. Despite these

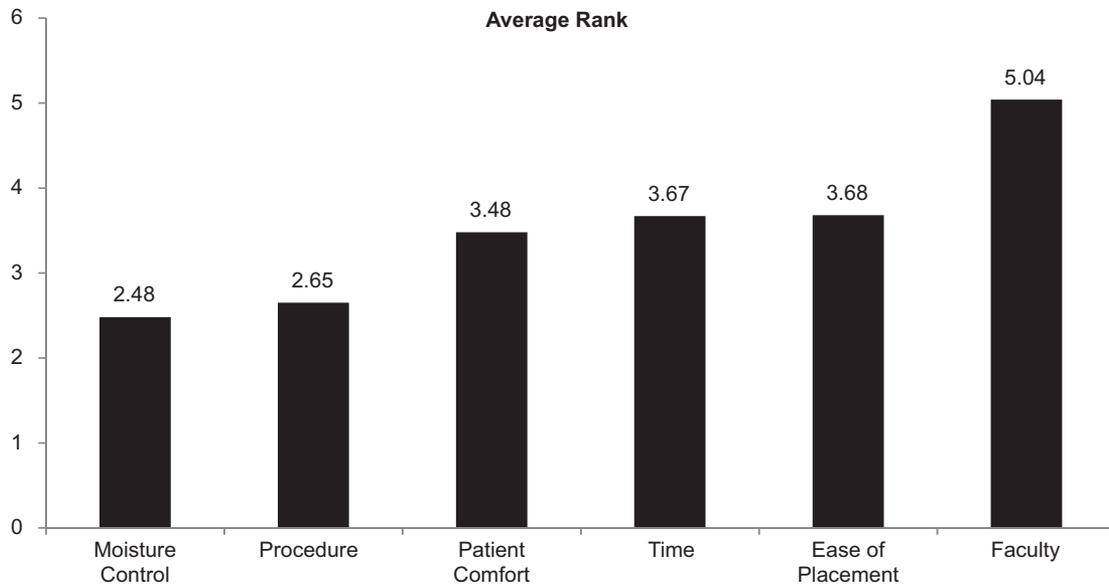
results, 84% of responding students (n=133) reported feeling they were taught good dental dam techniques in the preclinical operative dentistry course and 78% (n=123) that they were well trained clinically. However, 60% (n=94) reported wanting to become more proficient in dental dam placement.

The students' responses were significantly different for dental dam recommendation by faculty type ( $X^2(1, n=156)=64.8; p<0.001$ ). Among the respondents, 91% (n=141) reported their full-time faculty members recommended the use of the dental dam over the Isovac, but only 44% (n=69) reported the same for adjunct faculty members. The students ranked the following factors for determining whether to use dental dam or Isovac from greatest to least importance: moisture control, procedure, patient comfort, application time, ease of placement, and attending faculty (Figure 1). The students reported that 51% of their patients preferred the Isovac, 13% preferred the dental dam, and 36% were indifferent. The differences among patients were not statistically analyzed. Regarding using the dental dam after graduation, 142 of 164 respondents answered the question after we excluded those who responded non-applicable (students entering specialty training not involving operative dentistry). Of those 142 respondents, 57% (n=81) planned to use the Isovac, 28% (n=40) planned to use the dental dam, and 15% neither (n=21). Consequently, a total of 72% (n=102) never planned to use the dental dam for operative procedures after graduation. The percentage of students planning to use the dental dam ranged from 17-18% in four of the groups to a high of 47% in one group. There was insufficient evidence of a difference of dental dam usage after graduation across the groups ( $X^2(14, n=142)=15.21; p=0.3640$ ).

**Table 3. Dental dam knowledge questions, by percentage of correct responses of D3 (N=86) and D4 (N=78) respondents**

Question	D3	D4	p-value
1. What does the "W" on a dental dam clamp denote? A. Wing <b>B. Wingless</b>	45%	25%	0.0059
2. Which clamp is intended for a premolar? A. 56 B. 15 C. 3 <b>D. 2A</b>	26%	17%	0.1770
3. Which clamp is used to provide gingival retraction? A. 2 <b>B. 212</b> C. 56 D. 14	80%	87%	0.2450
4. Which of the following clamps is NOT intended for a molar? A. 56 <b>B. 2</b> C. 14 D. 3	31%	29%	0.6947
5. After dental dam placement, there is gingiva visible around the teeth and moisture leaks through. The most probable cause(s) is/are: A. Holes are punched too large B. Holes are punched too small C. Holes are punched too close together D. Holes are punched too far apart <b>E. A and C</b> F. B and D	13%	23%	0.0777

Note: The correct response to each question is in bold. The average number of correct responses was 1.9 (SD=1.17). Only on the first question was there a significant difference between the D3 and D4 students: p=0.0059.



**Figure 1. Factors students reported affecting their decision making regarding isolation techniques**

Note: Students ranked factors on scale from 1=most important to 6=least important.

## Discussion

Speculation that some techniques and procedures taught in dental school are not consistently applied in practice by graduates has been confirmed in other studies.<sup>16-21</sup> In our study, 72% of responding students (n=112) reported they never intend to use the dental dam after dental school for operative procedures. This finding is disappointing since no other isolation method can provide the combined safety and efficacy of the dental dam. However, these students' anticipated lack of use of the dental dam after graduation should not be surprising because it reflects the actual findings in a survey by Hill and Rubel.<sup>5</sup>

Students tend to struggle and become frustrated with dental dam placement especially when working alone. Overwhelmingly, these students said they found the Isovac much easier to place and more time efficient than the dental dam (Table 4). However, they perceived the dental dam provides better field of vision and better moisture control than the Isovac. Frequently, when we check students' preparations, we

find the dental dam to be torn, damaged, and lacking sufficient isolation of the operative field. Competence, efficiency, and expertise are gained through experience; these are only accomplished if educators prepare students effectively. Faculty members should educate students on proper technique that includes clamp selection and placement, dental dam inversion, protection of soft tissue, and the correct amount of isolation (number of teeth).

From some of the students' comments, it was apparent that many understood the benefits of the dental dam and would like to become proficient in its use especially when working without a dental assistant (Table 5). Seven of the 14 comments noted that an assistant is beneficial when placing the dental dam and for keeping the operative field clear of debris and water. It is impossible to single-handedly accomplish a preparation while simultaneously using indirect vision and expect to aspirate debris and water from the field. This situation may be the primary reason students are more inclined to default to the Isovac. Working with a dental assistant was

**Table 4. Students' responses regarding use of dental dam and Isovac, by percentage of total D3 (N=86) and D4 (N=78) respondents**

Survey Item	D3	D4
When working alone, placing the Isovac is easier than the dental dam.		
Agree	97%	92%
Disagree	3%	8%
When working with a dental assistant, placement of the dental dam is as easy as placing Isovac.		
Agree	40%	58%
Disagree	60%	42%
In your opinion, which provides better moisture control?		
Dental dam	66%	80%
Isovac	10%	8%
They are equally effective.	24%	12%
In your opinion, which provides better field of vision?		
Dental dam	49%	60%
Isovac	26%	14%
They are equally effective.	25%	26%
In your opinion, the Isovac is more time-efficient than the dental dam.		
Agree	85%	79%
Disagree	15%	21%
The patient preferred the:		
Dental dam	14%	12%
Isovac	53%	49%
Patient was indifferent.	33%	39%
The noise from the Isovac was annoying.		
Agree	58%	63%
Disagree	42%	37%

**Table 5. Students' comments provided voluntarily on survey**

Comments
"I feel the dental dam is a waste of time, but once it's placed the work gets done a lot faster than doing a case without a dental dam. So I like using it."
"For quick procedures, patients enjoy the Isovac, but after approximately 1.5 hours they start to complain of dryness. Patients are constantly taking it in and out. I waste time placing and removing it."
"I get better access with the dental dam. However, without an assistant, water splashes everywhere, and I have to hold the suction myself, which inhibits the use of indirect vision."
"I find the dental dam to be an extreme hindrance to my time, experience, results, and patient comfort. All my patients hate it. Constantly having to suction water from the field is time-consuming. Communication with the patient is hindered. I will not use a dental dam in my private practice."
"I like to use both consistently. The dental dam is helpful for removal of amalgam restorations and better moisture control. Isovac is great but limits lingual access."
"I love the dental dam, but there have been lots of cases when it hasn't been an option. I think we see a lot of composite resin restorations fail due to poor moisture control."
"I prefer the dental dam if I have an assistant: better isolation and fewer limitations. However, Isovac is much preferred by my patients."
"I prefer to do restorative work with a dental dam; however, I hate placing dental dams (especially without an assistant). It is much easier and time-efficient to use Isovac when working alone."
"If I have an assistant, I attempt the dental dam first. Without an assistant I use the Isovac. One thing is certain: I will never practice without either one, as they both prevent avoidable mishaps."
"Isovac has great uses especially when working on the most posterior tooth in the arch. It is also great for scaling and root planing and crown preparations. However, the dental dam is superior for humidity control."
"I like the dental dam, but it is hard to use without an assistant suctioning."
"The Isovac speeds up appointments because I don't have to stop to suction. I prefer the dental dam with an assistant who is suctioning."
"Most of my patients prefer the Isovac. It is very easy to place, even easier than the dental dam with an assistant. The Isovac is great for gingival lesions. Its only drawback is removing or placing amalgams. Amalgam debris doesn't always get sucked up into the Isovac holes."
"The dental dam is a beautiful thing."

not one of the choices available to select regarding students' decision making process in choosing isolation techniques. In hindsight, we suspect having a dental assistant may have been a high priority in the students' decision process. When working without a dental assistant, Lambert described a technique in which a saliva ejector is modified and anchored onto the dental dam clamp.<sup>22</sup> In their fourth year, students are required to complete four clinical sessions working with a trained dental assistant, and we have seen that students often ask, "Do I need to place a dental dam since I now have a dental assistant?" Hopefully, if faculty members are standardized, the response is "Yes, it makes it easier for both you and the assistant." Four clinical sessions working with a trained dental assistant are probably not sufficient to prepare students for private practice. Presently, there are only two dental assistants available to train students. This ratio of 1:105 is insufficient if we expect new dentists to be competent in four-handed dentistry upon graduation. If more dental assistants were available, we may see increased student eagerness to use the

dental dam and greater cognitive and psychomotor competence.

We have heard suggestions that a stand-alone dental dam competency be included in the clinical curriculum. Presently, our institution's Clinical Competency Manual is 138 pages and contains 37 formative and summative competencies. Most of these competencies must be satisfied in the fourth year as the third year is for skill development. As a result, the students experience competency fatigue. Four competencies relate to clinical operative dentistry: preparation and restoration of Class II, Class III, Class IV, and cuspal coverage restorations. Students are evaluated using a rubric with clearly defined expectations including isolation of the operative field. Not using a dental dam results in competency failure. Since our study found that GPGs were inconsistent in isolation techniques, it may be necessary to re-evaluate the rubric to ensure standardization across all eight GPGs. Rubrics have the potential to address uncertainties, better define assessment criteria, improve consistency, and improve quality of feedback.<sup>23</sup>

Our study found that isolation methods used for Class I and Class III restorations were not statistically different among the eight GPGs (Table 2). Only about a third of the students were using the dental dam for Class I restorations. These results showed that the faculty members are not calibrated as the clinical policy states that the Isovac may be used only in cases in which a dental dam cannot be placed. The dental dam in almost all cases can be placed when completing Class I restorations except for partially erupted third molars. For Class II restorations, dental dam use among the eight GPGs was statistically different ( $p=0.0222$ ). GPGs one, three, and four had statistically higher rates of dental dam usage for Class II restorations than the other GPGs. The students in GPGs three and four used the dental dam at least 60% of the time and more than 70% of the time for placement of Class II restorations (Tables 1 and 2). This finding is most likely a reflection of their group leaders, who are both retired from the Air Force Dental Corps and diplomates of the American Board of General Dentistry. The GPGs with the lowest use of the dental dam were groups that had a greater number of adjunct faculty and group leaders who came directly from private practice. In the Air Force Dental Corps, the dental dam was the standard of care and was to be used whenever possible. Dental dam use and reasons why it was not used were required documentation in the dental health records for every restorative procedure. A survey of general dentists in the U.S. Air Force Dental Corps found that 52.4% used the dental dam 81-100% of the time for all restorative work.<sup>24</sup> We have completed an unpublished study ascertaining faculty perceptions and application of the dental dam in their intramural faculty practice. Results of that study showed there were group leaders who never used the dental dam nor Isovac in their faculty practice, and their GPGs had the lowest rate of dental dam use in the current study.

Faculty calibration or standardization is necessary to ensure consistent application of the school's philosophy, protocols, and techniques regarding dental dam use. If faculty members are properly calibrated, then students' experience and education in all eight GPGs will be consistent. Calibration is difficult to obtain due to time constraints, different education levels and clinical experience, increased time spent by students in community-based dental education (CBDE), and an increasing number of adjunct faculty members. The general practice department at our institution has 17 full-time faculty members and more than 70 adjunct faculty members. About 25% of the

adjunct faculty are episodic, working as little as one half-day per month. Compounding the problem are students' spending approximately six weeks in their fourth year in community dental clinics. There has never been a general dentist faculty member from the general practice department who has visited any of these clinics to calibrate the supervising dentists. Students become frustrated because they are taught dental dam application in their preclinical course, have a choice of using the Isovac in the school's clinic, and then never see a dental dam during their required CBDE. As stated by O'Connor and Lorey in 1978 and re-emphasized by McAndrew in 2016, "effective student learning requires clear standards that are consistently applied."<sup>25,26</sup> All full-time and adjunct faculty in the general practice department are required to complete an online calibration course and obtain a passing grade on the self-assessment test prior to the end of fall semester. As a result, a great number of faculty members never complete calibration until the end of the semester. Faculty calibration should be accomplished first and remain a continuous process as standardization of faculty has been found to decline after initial training.<sup>27</sup>

Our study found that the two most important factors influencing the students' choice of isolation methods were moisture control and type of operative procedure (Figure 1). The Isovac was used more often, implying the students believed it provides comparable or better isolation and moisture control than the dental dam. However, this implication was contrary to their subjective appraisal that the dental dam provides better moisture control and field of vision than the Isovac. The factors of patient comfort, time, and ease of placement were ranked nearly identically. Interestingly, although these students reported that adjunct faculty members recommended the Isovac more often than the full-time faculty, faculty type (full-time or adjunct) had the least influence on the students' choice of isolation methods. Regarding patient preference, 51% of the patients preferred the Isovac, 13% the dental dam, and 36% were indifferent. If the last two preferences (dental dam and indifference) are combined, the total would be nearly equal to those who preferred the Isovac. Although we did not survey patients on their preferences, previous studies have found patient acceptance of the dental dam especially if its benefits are explained.<sup>28,29</sup>

Where does the disconnection between dental education and clinical practice after graduation occur? Clark et al. proposed these questions: is pre-clinical instruction adequate; is clinical experience

sufficient; are the procedures that are taught relevant; and is the dental dam required for every restoration?<sup>18</sup> Our survey answered the first question: these students' overall knowledge of the dental dam can be improved. The second question is answered by faculty observations on the clinic floor. The third question needs to be answered. The practice of dentistry should be evidence-based. If contamination of the operative field can be avoided and patient safety ensured, the dental dam may not be necessary for every restorative procedure. The Isovac may indeed be appropriate to use for some Class I preparations.

Three studies found that the Isolite (Isolite, Santa Barbara, CA, USA) was an effective alternative to using a dental dam or cotton roll isolation for sealant placement.<sup>30-32</sup> However, long-term retention of the sealants was not assessed. Clinical studies have been contradictory on whether the dental dam influenced the quality of restorations. A study evaluating 644 amalgam and 149 anterior composite restorations placed using a dental dam or cotton roll isolation did not find any difference in their failure rates.<sup>33</sup> However, the study was not blinded: the same operator who placed the restorations also evaluated them. Moreover, posterior composite resin restorations were not evaluated in that study. Raskin and Sectos evaluated Class I and Class II posterior composite resin restorations over a ten-year period using U.S. Public Health Service evaluative criteria and did not find any difference in the survival rate of restorations placed using dental dam or cotton roll isolation with aspiration.<sup>34</sup> A Cochrane systematic review using only randomized controlled trials concluded that there was a very low quality of evidence to suggest that using a dental dam compared to cotton roll isolation increased the longevity of direct restorations.<sup>35</sup> The Isovac and Isolite are rather new to the profession. Thus, that review illustrates the need for well-designed, randomized controlled studies to draw robust conclusions regarding effects of dental dam, Isovac, and Isolite use on the quality of restorations. Despite the method of isolating the operative field, if contamination with saliva and blood occurs, it will probably lead to decreased bond strength of adhesive restorations, increased microleakage, post-operative sensitivity, and recurrent caries. Despite lack of sound clinical evidence that use of the dental dam results in greater longevity of restorations compared to other isolation techniques, a correctly placed dental dam has an important medico-legal role in preventing aspiration and ingestion of debris, dental materials, or instruments. Therefore, use of the dental dam will

continue to be the legal standard, if not the technical standard, by which the dental profession is judged.

The response rate to our survey was good with 78% (n=164) of a possible 210 students completing the survey and 14 making comments. A limitation of this study was that it was primarily a subjective appraisal by students regarding their preferred method of isolation techniques. It was not a complete review of dental health records. Therefore, the actual quantitative use of isolation techniques may be different. There were only five questions regarding dental dam knowledge on the survey, which may not have been enough to ascertain students' overall dental dam knowledge and its correlation to clinical application. Four of the five questions were simply recalling information. The fifth question required critical thinking and a higher level of cognitive knowledge, but only 23% of D4 students (n=18) and 13% of D3 students (n=11) answered that question correctly. It may not be proper to draw conclusions regarding dental dam use based on students' rudimentary knowledge of the dental dam. Students mentioned in their comments that working without a dental assistant made dental dam use and operative dentistry more difficult. Having the opportunity to work with a dental assistant may provide a positive influence for students to use a dental dam. Not having enough well-trained dental assistants may have biased students to default sooner to using the Isovac. Finally, since this study took place at a single dental school, its results may not be generalizable to students in other institutions.

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## Conclusion

This study found that dental dam use was not consistent across the school's general practice groups and 72% of the responding students did not plan to use it in private practice. It may be that the students had not achieved competence in dental dam use in operative dentistry. For some operative procedures, the Isovac may indeed provide adequate isolation of the operative field. These findings suggest it may have been premature to introduce the Isovac as an alternative to the dental dam without first establishing clear clinical policy and faculty calibration. A good number of students expressed a desire to become more proficient in dental dam application. These results suggest that calibration of faculty, educating students, and increased use of trained dental assistants are needed to ensure student education is consistent across all general practice groups.

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