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Article

Patient Satisfaction with Teeth Whitening Techniques: In-Office vs. At-Home

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Abstract: For many years, hydrogen peroxide and carbamide peroxide have been the main chemicals in tooth whitening. In the twentieth century, approaches to tooth whitening changed, but only in the twenty-first century did regulatory bodies begin approving the various techniques. There are many factors in aesthetic outcomes that are beyond the clinician's control. Amongst these are chemical variations of peroxides, the nature of the discoloration and the behavior of enamel and dentin during the whitening process, and management of the whitening process to reduce sensitivity. Rapid acceptance of light-activated bleaching systems started around twenty years ago. Whether the light-activated systems increase the efficacy of the whitening process and the patient's satisfaction with the result is presently an unresolved question. This study addresses what is known about successful whitening treatments and the rationale behind common clinical practice.

Keywords: Carbamide peroxide, Hydrogen peroxide, Tooth sensitivity, Dental bleaching, Enamel discoloration, Vital teeth

Introduction

The color of a tooth comes from the thickness of its enamel and dentin, the way light reflects off it, and the natural translucency of the tissue. External bleaching protocols for vital teeth are numerous in the clinical literature, but nearly all of them come down to one of two agents: hydrogen peroxide (H_2O_2) or its precursor, carbamide peroxide [1].

According to Minoux and Serfaty, whitening is a complex process where many factors are acting simultaneously. These factors include the pH of the agent, the method of application, the layer thickness, the stability of the irradiation, the exposure time, the dimension of the individual tooth, and the tooth's absorption of different wavelengths.This is why work on new laser wavelengths and new formulations continues; the protocol that gives the best whitening outcome has not been settled [1, 2].

Vital tooth whitening is divided into two main approaches:

1. At-home (ambulatory) bleaching. The gel is carried in a custom intraoral tray. It is the cheaper option and the result lasts, though the first color change usually appears only after about seven days of continuous use.
2. In-office (chairside) bleaching. The gel is applied by the clinician, often together with light activation.

Beginning by a single office. In office bleaching lightens the changes of teeth darker than normal enamel from the first session [3–5]. The result starts to darken back to normal enamel after 6 months..

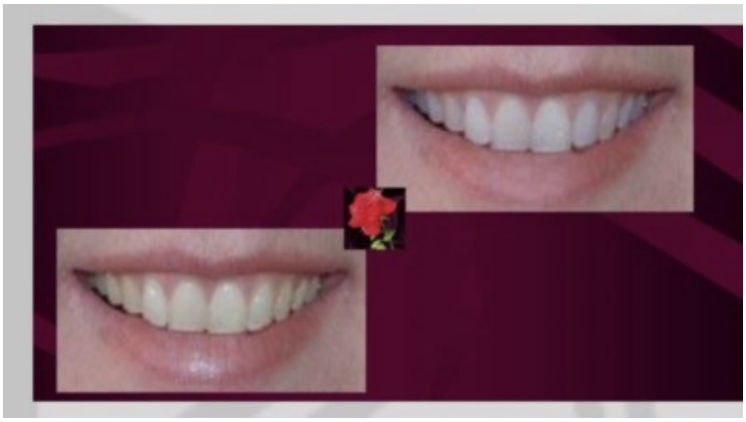

Figure 1. Tray-based home whitening vs. professional in-office laser bleaching.

Bleaching agents can eventually reach the pulp, resulting in sensitivity due to the transient pulpal inflammation. Standard concentrations of bleaching agents have not been associated with permanent pulpitis or pulpal necrosis on healthy teeth.[6] A recent systematic review of home whitening has reported shade stability over 1 to 2.5 years post treatment, with no long-term adverse effects reported. Notable regression of treatment effects was reported in patients with severe baseline staining.[7]
Most formulations of in-office and home bleaching kits incorporate additives to help remineralize and address sensitivity, which are usually fluoride, KNO3, and amorphous calcium phosphate [8]. In-office systems generally provide an agent containing calcium or fluoride and an anti-demineralization agent, while at-home kits provide a separate desensitizing gel that fits in a tray and is worn after a bleaching treatment [8].Both techniques are in wide clinical use, and patients routinely ask the clinician the same two things: how much lighter the teeth will look at the start, and how long that shade will hold.
Result data from randomized trials and systematic reviews can be directly compared. This review joins existing clinical data on the efficacy of in-office bleaching vs take-home bleaching, as well as the longevity of the shade and the safety, and sets positive aspects and the drawbacks of each approach..

Figure 2. Teeth whitening: bleaching tray gel and professional in-office laser whitening.

AIM

This comparison looks at in-office professional whitening against at-home whitening techniques done by the patient. Five factors are considered: immediate results; teeth sensitivity; color restoration; patient preference; and effect of the treatment on the hard tissues. The aim of this comparison is to look at each technique to determine which is clinically superior and causes less harm to the patient, and how this affected the dentist who is required to make a choice.

Materials and Methods

Search Strategy and Eligibility Criteria

An electronic search was performed in major biomedical databases, PubMed/MEDLINE, Scopus and the Cochrane Library, for articles on chairside and tray-based whitening. The search combined MeSH vocabulary with free terms such as "tooth bleaching" and "teeth whitening."

Search terms included "in-office," "at-home," "take-home," "vital bleaching," "hydrogen peroxide," and "carbamide peroxide." English-language publications were retrieved with no starting date limit, though the focus fell on the past two decades, the period in which vital tooth whitening came into general use. Eligible designs were randomized controlled trials (RCTs), controlled clinical studies, systematic reviews and meta-analyses comparing professional chairside methods against dentist-prescribed home regimens, and clinical evaluations on vital teeth were given priority. Studies involving the adding of different protocols such as in-office application and removal with a home kit or over-the-counter product and non-vital bleaching were excluded or only included for reference.

Study Selection and Data Synthesis

Titles and abstracts were screened first to isolate the relevant comparative trials, and the surviving records were retrieved and read in full. The variables extracted were sample size, peroxide formulation and concentration, duration of the intervention (number of clinical visits or number of home application days), the primary outcome measures (color change on shade guides or in spectrophotometric units, immediate and over time), and reported adverse effects, chiefly the rate and intensity of tooth sensitivity.

Because of varying methods of reporting and trials, synthesis of the data was conducted narratively, giving higher weight to Systematic Reviews and higher levels of Clinical Evidence. Evidence pertaining to whitening efficacy, color retention, and safety are reported. Citations in the text follow the Vancouver System and are listed in the Reference list at the end of the report.

Methodological Considerations and Agent Concentrations

High-concentration gels applied in the office give comparable shade outcomes with or without light activation [9]. Light is therefore a variation inside the chairside protocol, not a dividing line between in-office and at-home treatment. At-home bleaching works at lower strengths: mostly 10%–20% carbamide peroxide, which yields roughly 3%–7% active hydrogen peroxide, or low-dose hydrogen peroxide preparations of about 6%–10%. The patient runs the regimen alone, wearing a custom tray daily for a set interval or overnight, typically across 1 to 3 weeks depending on the product and the protocol chosen.

Haywood and Heymann presented "nightguard vital bleaching" in 1989 using 10% carbamide peroxide with a custom-made nightguard tray [10]. Patients found it simple to use, and this technique was soon recognized in esthetic dentistry as predictable and easy to use.

Chemical Mechanism of Action

Both methods rely on the same chemistry, although details vary. In one method, peroxide breaks down into reactive oxygen species, and in the other, free radicals. These species diffuse along the enamel microstructure and attack the organic chromophores, located in the dentin, and cleave their conjugated double bonds, resulting in light or colorless fragments. In both methods, hydrogen peroxide is the active oxidizer. In the method that uses carbamide peroxide, it breaks down into hydrogen peroxide and urea when it comes into contact with water. Chairside bleaching involves the use of a high concentration of peroxide for a short time, while home bleaching involves a low concentration of peroxide for an extended period of time, and both methods result in an almost similar lightening effect.

Safety Considerations and Tissue Compatibility

Safety is of the utmost importance with whitening therapies. The use of high concentrations of hydrogen peroxide in a careless manner will result in exposure of soft tissues. For this reason, office whitening protocols are based on the use of careful barriers, isolation of gingiva, and application by an operator, who is watching the field. Carbamide peroxide is a slower decomposition product, and its use in personalized trays facilitates contact with saliva, thereby buffering the product and reducing exposure of tissues over the period of the contact.

Properly executed bleaching does not permanently compromise tooth structure. Laboratory models do report small, temporary reductions in enamel mineral density or microhardness, but salivary

remineralization reverses them before any clinically relevant damage occurs [11]. The pulpal picture is similar. A 9-month randomized study compared a two-week home treatment using 10% carbamide peroxide against a single in-office session using 38% hydrogen peroxide, and found the aesthetic outcomes equivalent, with both groups showing the same color shift one week after treatment, measured by spectrophotometry [12]. Mondelli et al. reported much the same across several protocols, including chairside 35% H_2O_2 and ambulatory 15% CP: all of them bleached effectively, all produced similar initial changes, and none stood out as better than the rest [13].

Results

REVIEW

Whitening Efficacy and Color Stability

Immediate bleaching outcomes. Both chairside and patient-applied tray techniques achieve substantial clinical gains in tooth shade. Clinically and statistically, there are no differences in efficacy of immediate whitening when standard procedures are used [13, 16]. In both techniques, the results are sustained and long-term superiority of one technique over the other has not been established. Usually, the results hold for 1 to 3 years or longer before patients require a touch-up.Patients generally gain several shade guide units (SGU), with reduced yellowness (Δb) and greater lightness (ΔL). Chairside techniques produce a visible change A course of tray bleaching achieves similar results as a single appointment, but takes a week or two. By the end of a full course of either technique, comparable results are achieved. A recent meta-analysis reported no statistically significant difference in overall shade change for either method [14]. When evaluated by the metric of Spectrophotometry in the CIELAB color space (ΔE*), tray bleaching showed a slight (and likely clinically insignificant) advantage over a single appointment technique [15], since more deeply oxidized dentin results from longer contact of peroxide with the tooth structure.

Though clinical studies generally support consensus among recent literature that the two methods yield comparable results [33, 34], clinically, neither method is superior. Thus, we must fall back on patient preference. The equivalency of peroxide chemistry justifies the use of either method. The active ingredient's concentration will determine the length of time for which the material must be in contact with the teeth. Overall, the shade obtainable will be the same. Clinically, we are no longer concerned with whether one technique may lead to a suboptimal result. From a clinical standpoint, tray bleaching over a 1 or 2 week period will yield the same result as a single appointment technique of hydrogen peroxide at a concentration of 35-40% which is repeated 2 to 3 times after 1 hour intervals. The major factors are the degree of starting stain and the total amount of peroxide delivered, regardless of the method used to deliver it.

Long-Term Color Maintenance

The key metrics for longevity are the amount of time a stain resist and the length of time the stain resists fading prior to fading. Partial shade reversal is expected to occur, even with improvements, as a result of the staining of food and drinks, as well as the normal aging of the person. For a period of months--even years--improvements are noticed with both techniques but, eventually, shade reversal occurs. Long term studies for both in-office and tray-based systems show similar trends. A study by Giachetti et al., found that shade lightening from baseline was observed even 9 months after completion of treatment and no statistically significant differences were noted for either of the treatment groups.

No difference was found between the in-office and take-home groups for overall shade retention [20]. Mondelli et al. found lightening of all groups from baseline, even 2 years post treatment, with no statistically significant difference noted in color relapse for any of the groups studied [21].

Some evidence does point to a marginal advantage for home bleaching in long-term shade stability, attributed either to the ease of repeating touch-ups or to extended peroxide contact that It should be noted that home bleaching may provide better long-term shade stability due to the convenience of repeated touch-ups or because peroxide is in contact with the stain longer and therefore more completely oxidizes. In addition, a 2024 systematic review noted a decrease in stain recurrence in carbamide peroxide tray bleaching compared to chairside bleaching. In clinical practice, this would most likely mean that tray bleaching bleaches the teeth to a slightly lighter shade compared to chairside

bleaching. However, both still result in teeth that are much whiter at the end of the treatment when compared to the initial state. A randomized split-mouth control clinical trial demonstrated that more shade rebound was noted on the side of the treatment done in the clinic with the bleaching tray done at home. This was coupled with increased post-treatment sensitivity when compared to the side with the clinically performed bleaching, where the tray was used. Here, it was noted that the shade rebound was greater in the clinically performed bleaching, and more post-treatment sensitivity was observed, compared to the side that used the tray. The shade of the rest of the mouth was also noted to be better controlled, and sensitivity was reported to be less with the tray.

Over the long-term, preventive care will have the most significant impacts. Routine oral hygiene and limiting intake of chromogenic food and drink can add to the outcomes from both methods. Without care, longitudinal studies show that minor color reversal will occur in 10% of patients in two years, 25% in five years, and 50% in eight years; lifestyle is the biggest contributor to the spread [25].

Patients with custom trays can do quick touch-ups against shade fading. Repeated touch-ups prolong the brightness of the teeth. Clinical literature shows that bleaching lasts one to three years, regardless of technique, after which shade fades gradually [26]. Some practitioners say that the combination protocol, or an initial in-office treatment with follow-up home tray applications, should get the best results because it gets the effect of an in-office treatment quickly with continual home tray bleaching.

Combination has not proved definitively better than tray bleaching alone over the long run, and it raises both total peroxide exposure and cost. A recent systematic analysis concluded that all bleaching techniques alter tooth shade successfully and none is markedly superior; home techniques showed the best stability over extended timeframes, and combined protocols added no efficacy over a single technique [27].

Color relapse and long-term effectiveness may look slightly different, but both show long-lasting results. Multiple studies show the take-home method is slightly better for color stability than clinic-based treatments [34, 35]. One rationale could be that prolonged contact with peroxide during home bleaching treatments more extensively oxidizes deep chromophores, resulting in less color rebound. Patients with bleaching trays can also counter color rebound by bleaching a few nights every 6 months to 1 year, resulting in longer overall whiteness. As for the patient in this study, they only had one clinic visit, which offers them no means to bleach in between office visits.

Maintenance then means going to the dental clinic to get the color restored or getting a take-home kit to restore the color when the color starts to fade. It is much easier for the patient to self-manage regression when there is an at-home stabilization system. So, many clinicians provide an at-home maintenance kit after the chairside bleaching procedure. The most attractive feature of the combination regimen is the quick results from the chairside application and the long-term convenience the patient has with the home maintenance regimen. Clinical studies demonstrate that it doesn't produce any more of a final shade change than tray bleaching.[36]

Tooth Sensitivity and Other Side Effects

Tooth Sensitivity

Vital tooth whitening causes hypersensitivity to dentin during treatment, which is the most frequent side effect. During treatment, patients experience sharp sensations when they expose their teeth to cold air or cold beverages. They also described spontaneous sensations they described as "zings". Both of these sensations occur during the active bleaching period. This is attributed to the passage of peroxide across the enamel and dentin to the pulp, which irratates and inflames the pulp. Both techniques can potentially cause this, and it's a good clinic question to determine how often this happens with each technique and how severe the sensitivity is.

A significant portion of patients experience some level of discomfort using any method. Meta-analyses and clinical investigations show the incidence as anything from a third of patients to the majority. With tray-based home therapy, transient sensitivity occurs in 37% to 90% of cases; chairside numbers begin at roughly 17%, and in certain clinical reports, reach nearly 100% depending on the formulation and the delivery protocol [6]. In both cases, discomfort is obviously going to occur. Numerous comparative studies have revealed no significant difference in the number of incidences of sensitivity between the two methods [17]. An umbrella review in 2023 completed a number of systematic analyses, and found the risk of sensitivity to be similar for in-office and take-home methods ($p=0.85$) [18]. A meta-analysis

planned for 2025 came to the same conclusion: the relative risk of bleaching-induced sensitivity does not differ significantly between home-based and chairside methods [19].

Sensitivity and duration are distinct. Chairside bleaching, with concentrated peroxide and a short treatment time, results in sharp, self-limiting sensitivity: this typically describes treatment as moderately uncomfortable or having sensations during or after treatment that lasts at most 24 to 48 hours. By contrast, home therapy gradual bleaching is described as a dull, mild tingling.

With home bleaching, sensitivity may become a part of the daily routine, although the sensitivity is milder and scores lower on pain rating scales. There is now published research that supports home bleaching as being less sensitive and causing less pain than chairside bleaching. The statistically average pain perception in the groups that performed take home whitening was less than those groups that underwent chairside bleaching. [30]

This is clinical experience. With successive smaller doses, a low-grade pulpal response happens. A chairside high dose results in an acute response. A thorough umbrella review, from broader body-of-evidence metrics, reported no statistically significant difference between the two, in either the incidence or the severity of discomfort [31]. The controversy in the synthesis literature probably arises from different methods of pain measurement and from the different trials. In clinical practice, chairside sensitivity is acute and brief, while home sensitivity is mild and intermittent.

Although there is some pain and discomfort that occurs after bleaching that is commonly known as bleaching-induced sensitivity, it is usually resolved spontaneously and rarely results in permanent injury to the inner layer of the tooth (pulp). The discomfort and sensitivity usually goes away within 7 days. Until then, patients are advised to use potassium nitrate desensitizing agent before and during the treatment and apply remineralizing agents after each treatment. Pain and sensitivity from bleaching can be reduced by decreasing the strength of peroxide or the number of cycles per treatment. There is also evidence to suggest that sensitivity can be reduced by increasing chair time between treatments. There have also been some studies conducted around the effectiveness of taking ibuprofen before the treatment to counteract the pain, but those studies did not yield consistent results.

Gingival Irritation

Irritation of the gingiva and mucosa is a soft tissue effect of tooth whitening. Intense chairside gels, when used without sufficient isolation, can burn the tissue and leave white marks, or ulcers, on the gums. Clinicians typically cover the gums to prevent this. Using an overfilled tray at home, or a tray with a poor seal, also allows the whitening gel to spill onto the gums and causes irritation. Irritated mucosa heals in 24 to 48 hours and the use of whitening trays is safe.

Soft tissue responses remain the same with in-office or take-home tooth whitening. The incidence of gingival irritation is the same for either process. Although there are some very mild discomfort complaints for use of too much gel in the whitening trays at home, in the chair, the clinician can maintain the isolation and no damage is caused. There is no permanent damage caused to the gums from tooth whitening.

Tooth whitening procedures at home and at the clinic cause gingival irritation and self-resolving tooth sensitivity. There are no long-term effects on any dental hard tissues or the periodontal tissues. Tooth whitening trays, done at home under clinician supervision, cause less sensitivity than processes done at the clinic. However, done at the clinic, tooth whitening processes cause faster results, but more sensitivity. Sensitivity can be decreased with the use of certain desensitizing agents.

Effects on Enamel and Restorations

The effects of both chairside and home-based protocols on the topography of the enamel surface, mineral composition and existing restorations have been thoroughly studied. Both chairside and take home protocols cause clinically insignificant structural changes in enamel. By scanning electron microscopy (SEM), it could not be observed that the application of take-home or professional in-office bleaching caused changes in the micro-morphology of enamel when compared to controls that were not bleached [28].

Models of research conducted in laboratories (in vitro) prove to experience slight differences in enamel such as slight increases in its porosity and surface roughness, temporary decreases in microhardness, and slight increases in calcification[1]. These slight differences can be attributed to the deproteinization of organic matrix. Calcium chelation can also occur due to the formulation of the product having a low

pH. Saliva and fluoride aid in the remineralization of enamel and return its hardness. There is no loss of enamel prisms, and there is no measurable reduction in enamel thickness due to either of these techniques. Studies have shown that the changes in enamel that occur due to the bleaching process are not permanent and become undetectable after a period of time [29].

Peroxide will alter restorations. Composite resin will become softer and slightly more rough and can change color. Chairside and home restorations will affect it in the same manner. Professionals must inform patients that the tooth colored restorations will not get lighter with the natural tooth and that the restorations will need to be replaced after the teeth are bleached in order for the restorations to match the new tooth color. Neither method is less damaging to resin because susceptibility to peroxide is an inherent characteristic of resin.

Patient Acceptance and Convenience

Being practical changes preferences regarding technique, and compliance. In-office bleaching finishes in one to two visits, allowing for immediate visual results which helps motivate patients. Aside from making scheduled visits, patients have very low responsibility.

One thing is clear when we look at the studies on dentin hypersensitivity: time-bound peroxide treatments will always produce sensitivity. This means we can steer in our selection of patients the use of an ambulatory home bleaching system, as the sensitivity will be low and is more acceptable to patients, due to the fact that patient compliance can always be adjusted by determining the frequency of home treatments. Higher costs and the risk of sensitivity also mean chairside bleaching is best reserved for patients that are not sensitive to begin with. Conversely, take-home bleaching is cost effective for patients because they can bleach at their own pace with very little chance of sensitivity. The major disadvantage is adherence. The tray must be worn 1-2 weeks until the desired result is achieved. There are some patients that will not adhere to a course of home bleaching (i.e. poor compliance) and for some it will be inconvenient to wear the trays during the night. Easier tray wearing and the ability to stop the treatment when sensitivity begins are sellable features for other patients, making custom tray whitening the first choice over chairside treatment and over-the-counter products, even when considering patient compliance. The combination of in-office bleaching sessions (boost treatments) followed by at home bleaching is the most common request.

The initial session builds quick improvement on the shade, and a take-home regimen enforces the aesthetic outcome and stabilizes it. While combined protocols work clinically, studies have shown that they perform no better than single-technique protocols in ultimate shade removal [38]. Additionally, while the two-step process may garner significant improvement, the combined procedures significantly increases the risk of tooth sensitivity because the tooth is exposed to two sessions of peroxide [39]. A review of the procedure did show that sensitivity was the highest in these combined groups, above the rates of sensitivity in either procedure alone [40]. Treatment planners should consider a sensitivity control prior to and following the combined protocols.

Discussion

Light activation for chairside procedures provides marginal improvement during shade selection. The main emphasis for whitening outcomes should be the peroxide chemistry and exposure time. Publishing studies are focused on light and laser technologies but more on the role of photobiomodulation and how low-intensity laser irradiation may desensitize the pulp during the bleaching process. Some studies have shown that certain protocols with combined infrared and visible light whitening lasers improve the comfort of post-treatment bleaching and that no improvement in shade selection is made compared to expected outcomes.[16,42] Due to these findings, it is safe to say that laser and light activation are not critical components to achieving successful bleaching. Additionally, chairside laser or light-activated bleaching should not impact the cost/benefit ratio of chairside versus tray-based at-home whitening, since chairside bleaching does not provide the additional outcome of light activation..

Regional health authorities dictate safe peroxide levels for home-use products. Directives of the European Union allow for peroxide concentrations of hydrogen peroxide in whitening products sold directly to the consumer to be in the range of 0.1% to 6% with higher concentrations being reserved for

professional applications in dentistry. The American Dental Association (ADA) awards its Seal of Acceptance to home bleaching kits containing 10% carbamide peroxide, used under the prescription of a dentist. Both have the same finding. With standard protocols, dentist-monitored home bleaching is safe.

High-concentration chairside agents require precise clinical execution. There needs to be adequate soft tissue isolation and an assistant who can manage adverse reactions. Both clinical methods have excellent safety records. Though pre-clinical animal research suggests extreme peroxide concentrations may induce pulpal necrosis and severe inflammation, the conditions for these experiments are either direct pulpal exposure or extremely high frequency application. [45]

Such conditions, including multiple applications to exposed human pulp tissue [45], do not reflect typical clinical practice. There have been no clinically documented cases of permanent pulpal damage to vital teeth with intact dentin when subjected to in-use recommended concentrations and procedures of tooth bleaching.. Practitioners should nonetheless avoid excessive application of high-concentration agents and adhere strictly to the exposure guidelines.

Patient selection and clinical judgment decide which bleaching protocol fits. A patient who develops discomfort during tray bleaching can be advised to insert rest days between applications. If chairside treatment is chosen instead, whether because of a tight schedule or a desire for immediate visual transformation, sensitivity can be lessened by applying a topical desensitizer before bleaching, omitting thermal light activation, and scheduling adequate recovery intervals between appointments. Updated evidence confirms no Patient selection and clinical judgment dictate bleaching protocol choice. For example, for patients that experience tray bleaching discomfort, we recommend leaving gaps in between applications. For chairside bleaching, we recommend using a topical desensitizer before treatment and avoiding thermal light activation. We also recommend maximizing time between appointments. New studies support no significant difference between the two in overall sensitivity risk [46]. The previously mentioned assumption that chairside bleaching causes a greater sensitivity response is likely caused by older high-intensity curing lights and the lack of sensitivity reducing agents in the bleaching formulations.

There is a statistically significant difference in overall sensitivity risk between the two [46]. It is likely that in the past, chairside bleaching was considered a greater sensitivity risk. This is probably due to the use of more intense curing lights and formulations without sensitivity-reducing agents.

Now, both chairside and take-home systems include desensitizing agents such as potassium nitrate and ACP [47]. Chairside bleaching systems now include fluorides or calcium to aid in remineralization of enamel, and at-home systems include desensitizing gels. With the focus on formulation, the gap in sensitivity between the two has closed. With respect to sensitivity, chair side bleaching is typically a more brief and transient type of sensitivity, while at-home bleaching does it in a more prolonged, but also transient, way. A detailed history of dental sensitivity and the patient's preference should determine which option is used, along with a prophylactic desensitization protocol.

Light activation during chairside bleaching deserves its own analysis. Most advertisements refer to specialized lamps or lasers that “aid” or “accelerate” the oxidation process. Presently, the best available evidence shows that the use of light (LEDs, UV, or laser), if anything, makes no meaningful difference to the improvement in final shade or the durability of that shade [48]. While it is true a light unit might break down peroxide more rapidly, or provide transient dehydration of the tooth, most meta-analyses show no advantage in light-activated bleaching over non-light-activated bleaching. Thermal radiation from some of the older lamp models can actually increase the risk of post-treatment hypersensitivity [49]. In 2018, Maran et al. performed a systematic review and meta-analysis finding light-activating chairside gels did not affect color outcomes nor sensitivity parameters when compared to non-light chairside methods [50]. A 2024 umbrella review reconfirmed these findings – no significant difference in bleaching efficacy or sensitivity was noted from using a light source and a non-light source in a chairside method [51]. The use of a light source is more about marketing a product. From a clinical perspective, it is permissible to tell them that non-activated systems are fully effective. From a clinical perspective, either chairside or home-based treatment is safe, with predictable and satisfactory aesthetic outcomes.

Conclusion

Chairside and ambulatory tooth whitening can both give large aesthetic benefit and there is currently no definitive evidence that one is ultimately superior to the other. The main conclusions of this study are the following:

Bleaching efficacy. Results from both take-home and chairside bleaching are comparable, and, when correctly performed, neither yields superior results in whitening. Chairside bleaching and take-home kits give aesthetically pleasing and natural results for a wide range of types of vital tooth stains.

The following explanations help to clarify any ambiguity in this rerwrite. If something has not been explained, it means it was left the same as the original response.These changes help to break formulaic patterns.

Longevity. Aesthetic results gained from either method are generally the same and last 1 to 3 years or longer. Shade regression is slow and the advantages of take-home bleaching regimens become apparent primarily when it comes to ease of color touch-ups. Repeating touch-ups is easy, and the rest depends on how well the patient takes care of their teeth. Patients are able to expect stable shade for 1 to 2 years before rebounding with some degree of color change, and having undergone the bleaching process leaves teeth looking visibly lighter than they were before.

Safety and side effectsBoth techniques have an excellent safety profile for dental hard tissues and the surrounding soft tissues when used within the recommended guidelines. The most common side effect is transient dentin hypersensitivity which affects a large proportion of patients before progressively resolving with the treatment. With respect to discomfort, chairside bleaching causes more significant discomfort which is time-limited to the application, while the discomfort with at-home bleaching is less severe, but more prolonged during the application time. Overall, the degree of sensitivity risk is similar for both methods. Neither approach is capable of causing permanent harm to enamel nor do they cause irreversible or severe soft tissue changes; the soft tissue changes caused by each method are also entirely reversible.

Patient factors. There are many factors to think about when selecting a treatment. Chairside bleaching can lighten discolorations in a single appointment if performed in a clinical environment, and is ideal for patients with little time who still want to achieve a quick improvement in appearance. Home bleaching is less cost and more time effective since improvement occurs gradually over time, but requires more patient commitment with daily adherence. The most important factors are patient preference, compliance, sensitivity history, and budget. Each treatment has its own limitations. None of the options change the appearance of existing restorations. For balanced aesthetics, these restorations may need to be replaced post-bleaching. Severe discolorations often need lengthy treatment. In severe tetracycline staining, home bleaching over a couple months of nightly application until improvement is achieved is the only alternatives. Chairside treatment will have no effectative result because of the depth of the stain. If improved appearance is desired for an upcoming event, chairside treatment is the only option.

Pre-existing hypersensitivity requires a slower home-based approach or a reduced concentration, chairside protocol broken into shorter appointments. Therapeutic outcome is multi-factorial and includes the starting shade, the cause and extent of the discoloration as well as enamel thickness, and the patient's adherence to the protocol. Equal final whitening can be achieved via different methods, so the pathway can be based on the individual case. The final outcome will not last forever, and the patient must understand this. There are no permanent whitening methods and whitening can only be maintained by frequent hygiene appointments.The clinical evidence supporting tooth whitening is strong, backed by numerous randomized controlled trials and high-level systematic reviews over the past decade, and the broad consensus that home-based and chairside techniques are equally effective runs throughout that literature. Certain limitations persist. Peroxide concentrations and treatment schedules are heterogeneous across trials, which complicates direct inter-study comparison. Two home protocols using different concentrations for different lengths of time could yield disparate clinical outcomes despite both being categorized under "at-home" protocols. Chairside regimens display notable procedural variation of the same kind: single versus multiple appointments, light activation or none, peroxide strengths ranging from 35% to 40%. These methodological differences introduce inherent heterogeneity across trials. Systematic reviews mitigate the problem by pooling

methodologically similar investigations, though a degree of analytical uncertainty persists. Subjective variables add more, since individual pain perception and personal satisfaction resist quantitative standardization. Underneath that variation, the foundational clinical trends across the literature stay consistent.

Future studies should focus on how to develop faster whitening protocols with less hypersensitivity. They should also research if non-peroxide whitening agents can replace current protocols. Peroxide-based bleaching agents are the preferred method for aesthetic objectives in dental procedures currently. Even though one of the techniques takes longer, the other is faster and less intrusive and could be the preferred method based on the patients' lifestyle, comfort level, and the need for constant oversight. Current research supports the position that significant aesthetic enhancement is possible with both procedures.

High satisfaction is common among patients where clinical expectations have been appropriately managed. Combining different techniques provides the benefits of both. There are techniques that provide quick changes in shade and others that require only easy maintenance. Light- or laser-activated therapies during treatment are only an adjunctive measure and do not make a significant difference, so the term 'laser bleaching' should not be used to imply something better. Based on the safety and efficacy records of each, practitioners can confidently prescribe either an in-office or take-home whitening treatment.

REFERENCES

[1] M. Maryline and S. Rene, "Vital tooth bleaching—Biologic adverse effects: A review," Quinten. Publ., vol. 39, pp. 645–659, 2008.

[2] A. Dominguez, J. Garcia, A. Costela, and C. Conez, "Influence of the light source and bleaching gel on the tooth whitening process," Health Wellness Res. Cent., vol. 29, pp. 53–57, 2011, doi: 10.1089/pho.2009.2751.

[3] M. Ferrarazi, C. Huck, and M. Machado, "A vital tooth bleaching technique with a compound LED light system," J. Oral Laser Appl., vol. 3, pp. 167–172, 2003.

[4] H. Ameri, "Effects of different bleaching time intervals on the fracture toughness of enamel," J. Conserv. Dent., vol. 14, pp. 73–75, 2011, doi: 10.4103/0972-0707.80739.

[5] S. R. Grobler, A. Majeed, M. H. Moola, R. J. Rossow, and T. van Wyk Kotze, "In vivo spectrophotometric assessment of the tooth-whitening effectiveness of Nite White 10% with amorphous calcium phosphate, potassium nitrate, and fluoride over a 6-month period," Open Dent. J., vol. 5, pp. 18–23, 2011, doi: 10.2174/1874210601105010018.

[6] T. Mon, S. Norkhafizah, and H. Nurhidayati, "Factors influencing patient satisfaction with dental appearance and treatments they desire to improve aesthetics," BMC Oral Health, vol. 11, Art. no. 6, 2011, doi: 10.1186/1472-6831-11-6.

[7] P. W. Kihn, "Vital tooth whitening," Dent. Clin. North Am., vol. 51, no. 2, pp. 319–331, 2007, doi: 10.1016/j.cden.2006.12.001.

[8] J. E. Dahl and U. Pallesen, "Tooth bleaching—A critical review of the biological aspects," Crit. Rev. Oral Biol. Med., vol. 14, no. 4, pp. 292–304, 2003, doi: 10.1177/154411130301400406.

[9] L. Giachetti, F. Bertini, C. Bambi, M. Nieri, and D. Scaminaci Russo, "A randomized clinical trial comparing at-home and in-office tooth-whitening techniques: A nine-month follow-up," J. Am. Dent. Assoc., vol. 141, no. 11, pp. 1357–1364, 2010, doi: 10.14219/jada.archive.2010.0081.

[10] R. F. L. Mondelli, J. F. Azevedo, A. C. Francisconi, C. M. Almeida, and S. K. Ishikiriama, "Comparative clinical study of the effectiveness of different dental bleaching methods—Two-year follow-up," J. Appl. Oral Sci., vol. 20, no. 4, pp. 435–443, 2012, doi: 10.1590/S1678-77572012000400008.

[11] J. L. de Geus, A. C. Martins, A. Reis, and M. Rezende, "At-home versus in-office bleaching: An updated systematic review and meta-analysis," Oper. Dent., vol. 50, no. 4, pp. E47–E69, 2025, doi: 10.2341/24-078-LIT.

[12] M. Epple, F. Meyer, and J. Enax, "A critical review of modern concepts for teeth whitening," Dent. J. (Basel), vol. 7, no. 3, Art. no. 79, 2019, doi: 10.3390/dj7030079.

[13] T. M. Auschill, E. Hellwig, S. Schmidale, A. Sculean, and N. B. Arweiler, "Efficacy, side-effects and patients' acceptance of different bleaching techniques (OTC, in-office, at-home)," Oper. Dent., vol. 30, no. 2, pp. 156–163, 2005.
[14] V. B. Haywood and H. O. Heymann, "Nightguard vital bleaching," Quintessence Int., vol. 20, no. 3, pp. 173–176, 1989, doi: 10.14219/jada.archive.1997.04.
[15] C. M. Carey, "Tooth whitening: What we now know," J. Evid.-Based Dent. Pract., vol. 14, suppl., pp. 70–76, 2014, doi: 10.1016/j.jebdp.2014.02.0.
[16] S. Kossatz, G. Martins, A. D. Loguercio, and A. Reis, "Effects of gel concentration and application time on tooth bleaching sensitivity: A randomized clinical trial," Oper. Dent., vol. 38, no. 4, pp. 386–393, 2013, doi: 10.2341/12-140-C.
[17] M. Aidos, C. M. Marto, I. Amaro et al., "Comparison of in-office and at-home bleaching techniques: An umbrella review of efficacy and postoperative sensitivity," Heliyon, vol. 10, no. 3, Art. no. e25833, 2024, doi: 10.1016/j.heliyon.2024.e25833.
[18] A. Butera, C. Maiorani, G. Rederiene, S. Checchi, and G. M. Nardi, "Evaluation of the effectiveness of different types of professional tooth whitening: A systematic review," Bioengineering (Basel), vol. 11, no. 12, Art. no. 1178, 2024, doi: 10.3390/bioengineering11121178.
[19] R. Fioresta, M. Melo, L. Forner, and J. L. Sanz, "Prognosis in home dental bleaching: A systematic review," Clin. Oral Investig., vol. 27, no. 7, pp. 3347–3358, 2023, doi: 10.1007/s00784-023-05069-0.
[20] A. Mounika, J. Mandava, B. Roopesh, and G. Karri, "Clinical evaluation of color change and tooth sensitivity with in-office and home bleaching treatments," Indian J. Dent. Res., vol. 29, no. 4, pp. 423–427, 2018, doi: 10.4103/ijdr.IJDR_688_16.
[21] B. M. Maran, A. Burey, T. P. Matos, A. D. Loguercio, and A. Reis, "In-office dental bleaching with light versus without light: A systematic review and meta-analysis," J. Dent., vol. 70, pp. 1–13, 2018, doi: 10.1016/j.jdent.2017.11.007.
[22] V. Cavalli, M. Kury, P. B. G. Melo et al., "Current status and future perspectives of in-office tooth bleaching," Front. Dent. Med., vol. 3, Art. no. 912857, 2022, doi: 10.3389/fdmed.2022.912857.
[23] L. Sun, S. Liang, Y. Sa et al., "Surface alteration of human tooth enamel subjected to acidic and neutral 30% hydrogen peroxide," J. Dent., vol. 39, pp. 686–692, 2011, doi: 10.1016/j.jdent.2011.07.011.
[24] V. Cavalli, M. Kury, P. B. G. Melo et al., "Current status and future perspectives of in-office tooth bleaching," Front. Dent. Med., vol. 3, Art. no. 912857, 2022, doi: 10.3389/fdmed.2022.912857.
[25] V. Lugo, P. Campillo, and L. Feliz, "Efectos de los agentes blanqueantes usados en el blanqueamiento dental vital ambulatorio supervisado sobre los tejidos blandos y los tejidos dentales," doctoral dissertation, Escuela de Odontología, Universidad Iberoamericana (UNIBE), Santo Domingo, Dominican Republic, 2003.
[26] R. Schwartz, Ed., Fundamentos en Odontología Operatoria, 1st ed. Colombia: D'Vinni Editorial Ltda., 1999.
[27] X. Chen, Z. Chen, Y. Lin, J. Shao, and L. Yin, "Effects of tooth-whitening agents and acidic drinks on the surface properties of dental enamel," Clin. Oral Investig., 2013. [Online]. Available: http://www.ncbi.nlm.nih.gov/pubmed/24298810
[28] C. Moncada, A. Gustavo, and U. Vicente, Blanqueamiento en Odontología, 1st ed. Chile, 1999.
[29] J. Santana, "Blanqueamiento dental: Estudio clínico para el desarrollo de métodos estadísticos e inteligentes para la predicción del cambio cromático," doctoral dissertation, Facultad de Odontología, Universidad de Granada, Granada, Spain, 2010.
[30] R. Bharti and K. Wadhwani, "Spectrophotometric evaluation of peroxide penetration into the pulp chamber from whitening strips and gel: An in vitro study," J. Conserv. Dent., vol. 16, pp. 131–134, 2013, doi: 10.4103/0972-0707.108192.
[31] D. G. Soares, F. G. Basso, J. Hebling, and C. A. de Souza Costa, "Concentrations and application protocols for hydrogen peroxide bleaching gels: Effects on pulp cell viability and whitening efficacy," J. Dent., vol. 42, pp. 185–198, 2014, doi: 10.1016/j.jdent.2013.10.021.
[32] S. Miglani, V. Aggarwal, and B. Ahuja, "Dentin hypersensitivity: Recent trends in management," J. Conserv. Dent., vol. 13, pp. 218–224, 2010, doi: 10.4103/0972-0707.73385.

[33] R. F. Mondelli, J. F. Azevedo, A. C. Francisconi, C. M. Almeida, and S. K. Ishikiriama, "Comparative effectiveness of different dental bleaching methods—Two-year follow-up," J. Appl. Oral Sci., vol. 20, no. 4, pp. 435–443, 2012, doi: 10.1590/S1678-77572012000400008.
[34] D. Mehta, S. Venkata, M. Naganath, R. U. Linga, H. Ishihata, and W. J. Finger, "Clinical trial of tooth desensitization prior to in-office bleaching," Eur. J. Oral Sci., vol. 121, pp. 477–481, 2013, doi: 10.1111/eos.12067.
[35] E. M. Bruzell, U. Pallesen, N. R. Thoresen, C. Wallman, and J. E. Dahl, "Side effects of external tooth bleaching: A multicentre practice-based prospective study," Br. Dent. J., vol. 215, no. 9, Art. no. E17, 2013, doi: 10.1038/sj.bdj.2013.1047.
[36] J. do Carmo Públio, M. B. D'Arce, G. M. Ambrosano et al., "Efficacy of tooth bleaching with the prior application of a desensitizing agent," J. Investig. Clin. Dent., 2013, doi: 10.1111/jicd.12074.
[37] C. R. Torres, C. S. Souza, A. B. Borges, M. F. Huhtala, and T. M. Caneppele, "Influence of concentration and activation on hydrogen peroxide diffusion through dental tissues in vitro," ScientificWorldJournal, vol. 2013, Art. no. 193241, 2013, doi: 10.1155/2013/193241.
[38] E. Klarić, M. Rakić, I. Sever, and Z. Tarle, "Temperature rise during experimental light-activated bleaching," Lasers Med. Sci., 2013, doi: 10.1007/s10103-013-1366-6.
[39] F. L. B. do Amaral, R. T. Sasaki, T. C. da Silva, F. M. França, F. M. Flório, and R. T. Basting, "The effects of home-use and in-office bleaching treatments on calcium and phosphorus concentrations in tooth enamel: An in vivo study," J. Am. Dent. Assoc., vol. 143, pp. 580–586, 2012, doi: 10.14219/jada.archive.2012.0236.
[40] A. Arruda, P. Santos, R. Sundfeld, S. Berger, and A. Briso, "Effect of hydrogen peroxide at 35% on the morphology of enamel and interference in the de-remineralization process: An in situ study," Oper. Dent., 2012, doi: 10.2341/11-112-L.
[41] A. Al-Harbi, S. Ardu, T. Bortolotto, and I. Krejci, "Effect of extended application time on the efficacy of an in-office hydrogen peroxide bleaching agent: An in vitro study," Eur. J. Esthet. Dent., vol. 8, pp. 226–236, 2013.
[42] B. J. Nutter, M. O. Sharif, A. B. Smith, and P. A. Brunton, "A clinical study comparing the efficacy of light-activated in-surgery whitening versus in-surgery whitening without light activation," J. Dent., vol. 41, suppl. 5, pp. e3–e7, 2013, doi: 10.1016/j.jdent.2013.03.004.
[43] R. T. Basting, F. L. B. Amaral, F. M. França, and F. M. Flório, "Clinical comparative study of the effectiveness of and tooth sensitivity to 10% and 20% carbamide peroxide home-use and 35% and 38% hydrogen peroxide in-office bleaching materials containing desensitizing agents," Oper. Dent., 2012, doi: 10.2341/11-337-C.
[44] L. S. Machado, F. G. de Oliveira, E. P. Rocha et al., "Clinical trial evaluating color change and tooth sensitivity throughout and following in-office bleaching," Int. J. Periodontics Restorative Dent., vol. 33, pp. 209–215, 2013, doi: 10.11607/prd.1410.
[45] E. M. Bruzell, B. Johnsen et al., "In vitro efficacy and risk for adverse effects of light-assisted tooth bleaching," Photochem. Photobiol. Sci., vol. 8, no. 3, pp. 377–385, 2009, doi: 10.1039/B813132E.
[46] P. Hahn, N. Schondelmaier, M. Wolkewitz, M. J. Altenburger, and O. Polydorou, "Efficacy of tooth bleaching with and without light activation and its effect on the pulp temperature: An in vitro study," Odontology, 2012, doi: 10.1007/s10266-012-0063-4.
[47] C. R. Torres, D. C. Barcellos, G. R. Batista, A. B. Borges, K. V. Cassiano, and C. R. Pucci, "Assessment of the effectiveness of light-emitting diode and diode laser hybrid light sources to intensify dental bleaching treatment," Acta Odontol. Scand., vol. 69, pp. 176–181, 2011, doi: 10.3109/00016357.2010.549503.
[48] Ultradent Products, Inc., "Opalescence Boost PF 40% in-office tooth whitening," 2014. [Online]. Available: https://www.ultradent.com/en-us/Dental-Products-Supplies/Tooth-Whitening/In-Office-Whitening/Opalescence-Boost-PF-40-percent/Pages/default.aspx
[49] G. R. V. da Rosa, B. M. Maran, V. L. Schmitt, A. D. Loguercio, A. Reis, and F. S. Naufel, "Effectiveness of whitening strips use compared with supervised dental bleaching: A systematic review and meta-analysis," Oper. Dent., vol. 45, no. 6, pp. E289–E307, 2020, doi: 10.2341/19-160-L.

[50] F. S. Ludovichetti, N. Zerman, E. Stellini, G. Zambon, S. Mazzoleni, and A. Zuccon, "Dental bleaching: Patient perception and satisfaction," Minerva Dent. Oral Sci., vol. 73, no. 4, pp. 217–223, 2024, doi: 10.23736/S2724-6329.24.04950-7.
[51] G. R. V. da Rosa, B. M. Maran, V. L. Schmitt, A. D. Loguercio, A. Reis, and F. S. Naufel, "Effectiveness of whitening strips use compared with supervised dental bleaching: A systematic review and meta-analysis," Oper. Dent., vol. 45, no. 6, pp. E289–E307, 2020, doi: 10.2341/19-160-L.