

WHITE PAPER

The Five Benefits of Prosthetic-Driven Implant Planning



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Overview:

Time Is Valuable For Doctors— and Patients

The demand for implant treatments is on the rise and so are expectations. Patients are now more informed about the procedure, and they demand results that are both highly functional and aesthetic—in the fewest number of appointments possible. That’s a real challenge for the dental professional. On the one hand, less chair time is a cost reducer. But on the other, meeting those expectations for high-quality outcomes in a shorter amount of treatment time is a tall order. The pressure is on to improve the process.

In this increasingly cosmetic-focused environment, there are also highly experienced oral health professionals who might not immediately see the value in changing anything about the way they place implants. They are satisfied with their success and their patient outcomes. Why should they stray from their proven approach that they find so comfortable and familiar?

The answer is time savings. That’s the first benefit that clinicians will find when they embrace prosthetic-driven implant planning and digital implant workflow, and the implications of this time savings should not be underestimated.

This paper examines the value that prosthetic-driven planning brings to the implant placement process—benefitting the clinician and the patient.

BENEFITS OF PROSTHETIC-DRIVEN PLANNING



Time savings



More predictable,
higher quality
outcomes



Enhanced
collaboration
with treatment
network



Increased case
acceptance rates



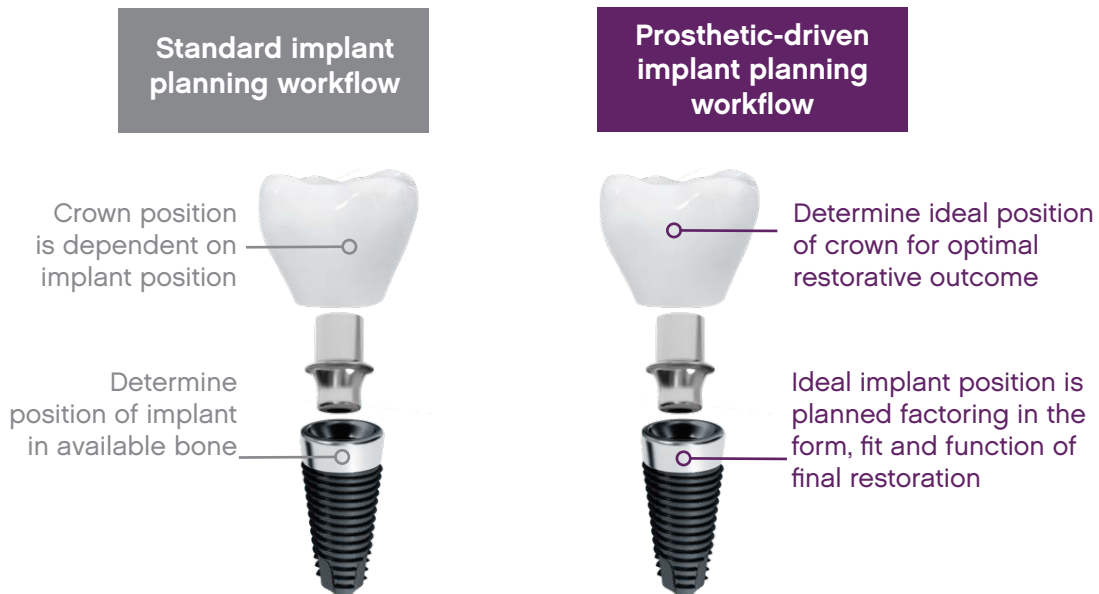
Greater patient
satisfaction



All About the Outcome

The traditional methodology behind an implant workflow involves placing the implant first in the available bone. At that point, the clinician then determines where the crown should be positioned. Prosthetic-driven planning, however, reverses this process with a crown-down approach. With prosthetic-driven planning, the outcome lies at the heart of the workflow, driving the process from start to finish. And by taking this approach, there are no unwanted surprises at the restorative end of the process. There's no need to courageously step in and salvage a situation with extensions, custom abutments and other compromises when it's time to place the restoration. Instead, the clinician has more predictable—and often higher quality—outcomes.

TRADITIONAL WORKFLOW VERSUS CROWN-DOWN WORKFLOW



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THE PROSTHETIC-DRIVEN PLANNING WORKFLOW

The prosthetic-driven planning workflow starts with taking a cone beam computed topography (CBCT) scan of the patient. The doctor uses this imaging to identify anatomical obstacles and evaluate bone structure, mandibular nerve and sinuses. The next step is to create a digital model, which can be accomplished in one of two ways: The clinician can use an intraoral scanner to create a digital impression; or the clinician can take a traditional impression and then scan the impression using a CBCT system. Then, using implant planning software, the data from the CBCT scan and digital impression are merged together. See Figure 1.

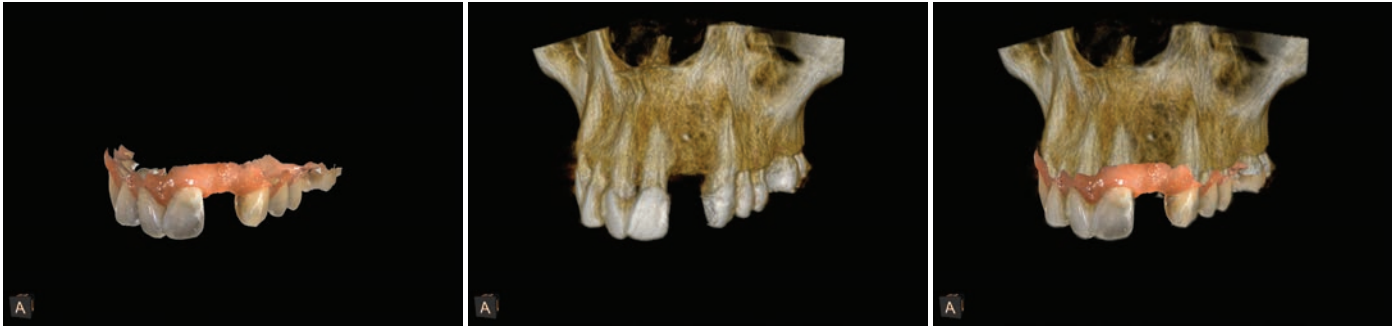


Figure 1: Using virtual treatment planning software, the data from the CBCT scan and digital impression are merged together.

What is the point of obtaining both extraoral and intraoral images? While the clinician can gain valuable insight about the mandible or maxilla, CBCT does not provide enough information about the surface detail of the teeth or soft tissues.² When the CBCT information is combined with the virtual impression in the interactive treatment software, the doctor's diagnostic capabilities are greatly enhanced, and, consequently, so is the treatment planning.

At this point, the clinician can then begin to plan the implant and abutment, taking into account the form, fit and function of the final restoration. The interactive implant planning software provides multiple views, enabling the clinician to evaluate potential implant receptor sites with greater accuracy. Through the software, bone can be “removed” or displayed with transparency, which helps in determining the precise placement of implants, abutments and translucent virtual teeth in proximity to the natural tooth root structure. A virtual crown is used to guide the placement of the virtual implant for optimal aesthetics and function. This allows for well-informed conclusions to be drawn about crown-to-implant ratio, implant diameter and length, and the design of the restoration in terms of screw or cement retention.³ See Figure 2.

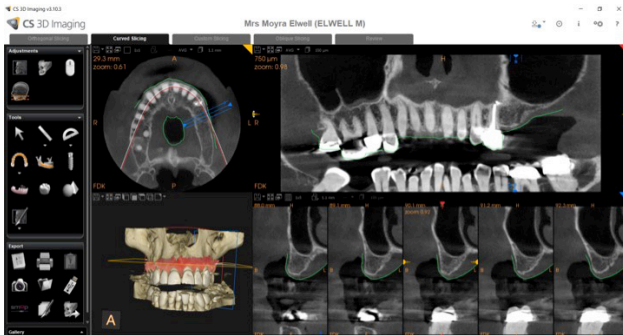


Figure 2: Informed conclusions can be drawn about crown-to-implant ratio, implant diameter and length and the restoration design

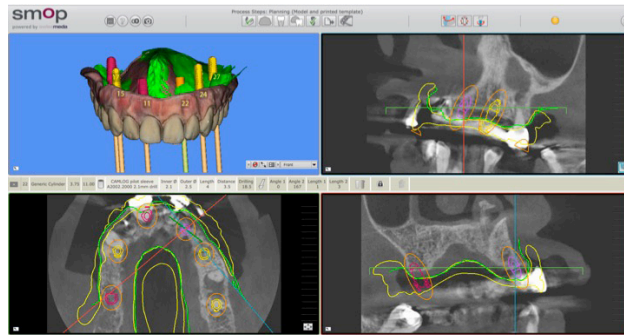
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A clinician whose treatment plan includes crystal-clear 3D images and a highly defined, step-by-step approach is quite compelling.

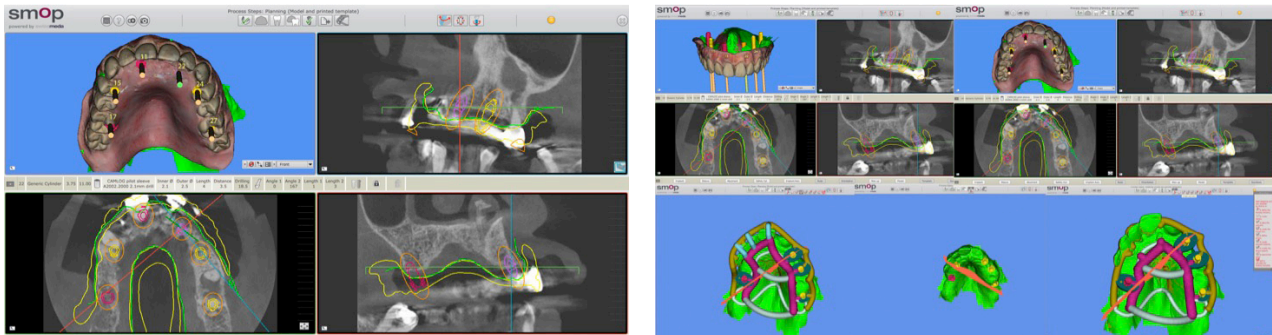
The next step involves exporting the 3D data into third-party software for the design and fabrication of the surgical guide by the treatment network.



Automatic matching in imaging software



Treatment planning in third-party software



Surgical guide design

Thanks to the prosthetic-driven planning workflow, implants can be placed with a level of accuracy and consistency that's hard to achieve through conventional implant placement.⁴ With all of that upfront information and planning, successful outcomes are much more likely to be delivered without unforeseen challenges.

It's also important to highlight the strategic role that the surgical guide plays. However, the guide is only as good as the plan that went into creating it, and it is not a guarantee of a successful outcome but rather a safety measure and facilitator. Greater precision in the implant process is possible only with the complete evaluation of the receptor site, the implant dimensions, the abutment type and the components required to surgically complete the case. Obtaining this insight upfront prepares all members of the implant team for a no-surprise, outstanding outcome.⁵



Impact on Case Acceptance

Before patients agree to undergo implant treatment, they need to feel confident about the clinician and the diagnosis. They also want to understand the associated costs. Co-diagnosis is an important step in treatment acceptance, and having the tools to clearly communicate and educate patients are essential in building trust and assuaging concerns. They are also key in obtaining acceptance of the proposed treatment.

A clinician whose treatment plan includes crystal-clear 3D images and a highly defined, step-by-step approach is quite compelling. It helps patients visualize their aesthetic outcome. This treatment plan delivers the message that the clinician has thoroughly thought through the process and has invested in the technology to ensure success. In addition, with a complete understanding of the patient's anatomy and clinical situation—thanks to extraoral and intraoral 3D imaging—the clinician can confidently estimate the costs. The prosthetic-driven planning protocol removes surprises and guesswork.

This comprehensive treatment plan engages patients and embodies the peace of mind that they are looking for.

KEYS TO CASE ACCEPTANCE



Clear communication



Co-diagnosis through education



Greater patient confidence



Enhanced Collaboration Capabilities with Treatment Network

The clear, illustrative images obtained through CBCT scanning and the digital impression are excellent for communicating with the referring doctor and all members of the implant team.⁶ They greatly enhance the clinician's ability to collaborate across the treatment network.

CBCT scanning produces DICOM, which is a universal format and is supported by many of the 3D viewers available on the market—and also facilitates collaboration. There's no need to worry that a member of the treatment network will have difficulty reading the files.

As long as the files produced are in an open format, the clinician can exchange files quickly and easily with the treatment network. Files with a closed format can also be exchanged. However, those files require users to stay within the closed environment, which limits their flexibility in using other partners.

Clinicians can create a digital impression and—while the patient is still in the chair—send that information to the lab for review. If the lab wants an area to be rescanned or the proposed design to be modified, the clinician can do so immediately. There's no need for an additional office visit, saving valuable chair time and preserving the patient's confidence in the clinician's methods.

The lab can also quickly evaluate and anticipate the technical complications and considerations in producing the final prosthesis. Doctors can use this information to more accurately estimate their cost and patient pricing.

Digital technology plays a key role in producing the final prosthesis. The intraoral scanner enables the clinician to use a scanbody, which is a post that attaches to the implant fixture. The scanbody helps the clinician acquire the implant position and provides the information required to design the restoration.

Interactive software typically enables the clinician to generate an implant report to aid in the ordering of the components needed for implantation. The report can also be shared with labs and referring clinicians.



Increased Patient Satisfaction

FASTER TREATMENT

From the initial appointment, the prosthetic-driven implant workflow expedites the treatment process. Digital impressions are significantly faster to obtain than traditional impressions. They eliminate the need for creating a physical model or wax-up. The implant planning software merges the files from the digital impression and CBCT scan, and the clinician can present the treatment plan to the patient—all within the first appointment. If the patient accepts the treatment plan, he/she can schedule surgery.

Because files are sent electronically between each member of the treatment network, there are no shipping delays to factor in. The combined use of 3D imaging technology and CAD/CAM restoration promotes the immediate loading of the restoration and saves significant time in the post-operative phase.

PROTOCOL COMPARISON FOR IMPLANTS USING SURGICAL GUIDE AND IMMEDIATE LOADING

	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6
Traditional	Take multiple impressions; Scan with CBCT	Get bite registration	Confirm functionality and aesthetics with wax model	Perform a dual scan protocol with CBCT	Place implant and take impression with implant in place**	Insert prosthesis
Prosthetic-driven implant planning method	Create HD 3D digital impression; Scan with CBCT; Plan implant*	Place implant and create new HD 3D digital impression with implant in place**	Insert prosthesis	-	-	-

* Complex cases may require an additional appointment for case presentation to the patient

** Depending on the loading protocol, impressions may require an additional appointment

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GREATER COMFORT AND HIGHER QUALITY OUTCOMES

Since prosthetic-driven planning typically involves the use of a flapless approach, the procedure is less invasive. Patients experience less pain, swelling and overall postoperative discomfort.

With the extensive planning that goes into the prosthetic-driven planning workflow, there's less chance for unintended events, which can set back the final treatment plan and substantially increase treatment costs and treatment time.

Less invasive procedures lead to better restorative outcomes:

“A recent study to assess prospective implant sites using panoramic radiography versus panoramic scans combined with CBCT imaging revealed that CBCT increases the accuracy of treatment planning in predicting the actual implant dimensions required at surgery. Performing a CBCT scan during the planning phase increases the accuracy of predicting implant length considerably, from 40 percent after the initial 2D scan to 69.5 percent. The overall outcome is a more predictable surgical and restorative result.”⁷

COST SAVINGS

Because prosthetic-driven planning deals with digital files, there are no shipping costs to factor in for impression creation. With the extensive planning that goes into the prosthetic-driven planning workflow, there's less chance for unintended events, which can set back the final treatment plan and substantially increase treatment costs and time.

Conclusion

With the insight obtained through CBCT scanning, intraoral scanning and the prosthetic-driven planning workflow, the clinician can place implants with a level of precision, accuracy and consistency that's hard to achieve through traditional implant placement. Efficiencies are built in throughout the process, resulting in fewer appointments from start to finish. Intraoral scanners and CBCT imaging streamline the digital workflow with images that facilitate diagnosis, treatment predictability, patient education and surgical accuracy. The prosthetic-driven planning workflow also eliminates guesswork and increases clinician confidence. Through faster treatment times, improved patient comfort, reduced cost, and higher quality—more predictable—outcomes, the benefits to be gained by both the clinician and the patient are considerable.

Outstanding outcomes are attainable without prosthetic-driven planning. However, the clinician will undoubtedly discover that, when prosthetic-driven planning is part of the process, those outcomes can be delivered more quickly and reliably—and likely at a lower cost.

Why Carestream Dental's 3D Imaging Solutions?

Carestream Dental can cover much of the entire treatment workflow, from imaging and diagnosis, to the fabrication of the surgical guide. Clinicians can obtain the precision they need to confidently plan and place implants—ensuring optimal outcomes each and every time.

FOUR EASY STEPS



- **Scanning and diagnosis:** Carestream Dental's 3D imaging systems cover the entire implant process. Clinicians can see the complete picture of the clinical situation with the CS 8200 3D or CS 9600 CBCT system, enabling them to evaluate bone volume, mandibular nerves, and sinuses. Then, the soft tissues and surface detail of the teeth can be captured using the clinician's preferred intraoral scanner. 3D data is then stored centrally in single imaging software to facilitate and expedite data management and retrieval.
- **Merge data:** Simply import the digital impression STL / PLY format files from the third-party intraoral scanners into CS Imaging software. Then, the CBCT and digital impression data are merged automatically in the implant planning software with little-to-no manipulation required.
- **3D planning:** User friendly and intuitive, CS 3D Imaging software takes the process of planning implants to a whole new level of efficiency and precision. Clinicians can add virtual crowns and select from a comprehensive library of implants (from more than 90 manufacturers) to virtually place implants in the appropriate axis and then add abutments. They can also create their own implants and manage their own library. Clinicians can view the location of the proposed implant in relation to the bone and restoration—on the same screen—to ensure optimal positioning and aesthetic results.
- **Guide creation:** To create the surgical guide, clinicians—with just one click—simply export the 3D data into their preferred third-party surgical guide software including SMOP, Blue Sky Bio and 360imaging thanks to the open file format. Clinicians can easily generate implant reports—again, with a single click—which helps them effectively prepare for surgery and share information with the treatment network, referrals and patients.

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UNIQUE COLLABORATIVE CAPABILITIES

With Carestream Dental software solutions clinicians can:

- Exchange files effortlessly with the implant network to speed up workflow.
- Enable the implant network to open 3D files simply with the CS MeshViewer and CS 3D Imaging software.
- Integrate the implant network and CAD/CAM workflow easily with versatile 3D file format options: STL, PLY, DICOM.

USER FRIENDLY AND HIGHLY INTUITIVE SOFTWARE

- The software automatically aligns the digital impression with the CBCT scan so clinicians can obtain the virtual setup with little-to-no manipulation.
- Intuitive tools enable clinicians to make alignment adjustments manually if needed.
- Clinicians can generate an implant report in one click to order the components needed for surgery and share with labs and referrals.

Implant planning can be exported into third-party software for surgical guide fabrication from manufacturers:

SMOP by Swissmeda • Blue Sky Bio • 360 Imaging

Export both CBCT data (DICOM) and digital impression (STL) with just one click to easily share with 3rd party surgical guide providers.

ENHANCED PATIENT COMMUNICATION AND EDUCATION

Prosthetic-Driven Implant Planning module enables clinicians to facilitate patient communication and education. It can help patients understand the entire implant process from start to finish, address their concerns and build their confidence in the treatment plan. For example, using Carestream Dental's implant planning software, clinicians can show their patients images of their crown build-up. Clinicians can then assure them of the higher quality outcome that results from using the prosthetic-driven planning workflow: "If I place a standard abutment, not an angled abutment, you will have the strongest, easiest and most cost-effective implant option."

About Carestream Dental

From the first dental radiographic film and the world's first digital intraoral sensors to cutting-edge low-dose 3D imaging technology, Carestream Dental consistently invests in research and development to continue innovations in dentistry that better address and anticipate the needs of oral health professionals across the globe.

Our primary goal is to help oral health practices deliver diagnostic excellence through the use of humanized technology and streamlined workflows. Our product portfolio includes specialty-specific practice management software; imaging software with specialty-specific workflows; panoramic and cephalometric imaging; and 3D imaging systems, as well as other intraoral and extraoral imaging equipment.

Carestream Dental is committed to transforming dentistry, simplifying technology and changing lives. In this pursuit, we focus on providing cloud solutions and technology for practice and clinical management for dental practices, groups, DSOs and partners. For more information, please visit carestreamdental.com.

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4 Abai, Siamak and Dalmau, Zach. "Immediate Final Restorations: A Comprehensive Digital Approach to Implant Dentistry," <http://glidewell dental.com/education/inclusive-dental-implant-magazine/volume-4-issue-3/immediate-final-restorations/>.

5, 6 Ganz, Scott D. "The Next Evolution in CBCT: Combining Digital Technologies," <https://eliezerganon.wordpress.com/2014/08/02/the-next-evolution-in-cbct-combining-digital-technologies/>.

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