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3D printing

international magazine of dental printing technology

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Dr George Freedman

Editor-in-chief

3D printing in dentistry: The need for standards

3D dental printing is in its formative stages; the major distinction between the comparable developments of dental cosmetics and implants is that printing is progressing much more rapidly, much more internationally and in a far more open-source environment. The exciting expectation is that 3D printing promises to bring the functional and artistic control of the restorative process back to the chairside setting. The daunting concern is that the wide spread of research and multiple technical developmental lines will lead to mutually incompatible nomenclatures and technologies.

The digital transformation of dentistry is firmly established. It promises to transform the practice and delivery of dentistry within a decade or two. It remains essential that dentists and the dental industry continue to develop a setting where communication is enabled by corresponding software platforms and technologies have both backward and forward flexibility, and most importantly, a research and development space where the terminology is standardised and mutually comprehensible.

Current 3D printers can manage the increasing demand for temporary, transitional, and permanent restorations and appliances. They can decrease delivery costs for these services, enhancing patient accessibility and dentist practice viability. To speed general practitioner acceptance worldwide, there must be a defined set of clinical standards that ensure treatment predictability and success, and a suitable lexicon of readily understood terms for this innovative area of dentistry.

At the level of researchers, developers and manufacturers, this requires the establishment of a broadly recognised and accepted framework of measurements, standards and guidelines. These paradigms should encompass most of the existing leadership of 3D printing at various levels, serving to delineate a basis for compatibility, providing adequate space for flexibility and growth, that can reasonably accommodate foreseeable (and perhaps unforeseen) upcoming development. These foundational definitions will establish the future guidelines for applications that are yet to be developed and will institute continuity between the present and the future.

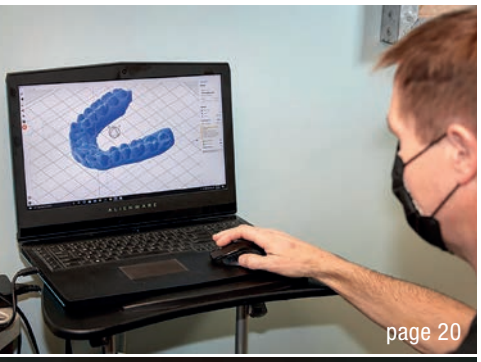
For the practising dentist, 3D dental printing is a wonderful addition to the clinical armamentarium. It is also something new, something different and something with its own vocabulary. The most important step to achieving universal chairside acceptance of this technology is to make it easy to understand; every technology brings its own wordlist, and every new technology has many competing wordlists that only serve to confuse the practitioner. It is impossible to explore innovative treatments without innovative words and meanings; we should attempt at the very least, however, to standardise these new terms and meanings to minimise the confusion as much as possible.

This editorial is a call to create 3D dental printing standards groups for defining:

1. a set of clinical, research, development and manufacturing guidelines; and
2. standardised nomenclature.

3D printing is the future of dentistry. Let us begin by creating the proper foundations.

Dr George Freedman
Editor-in-chief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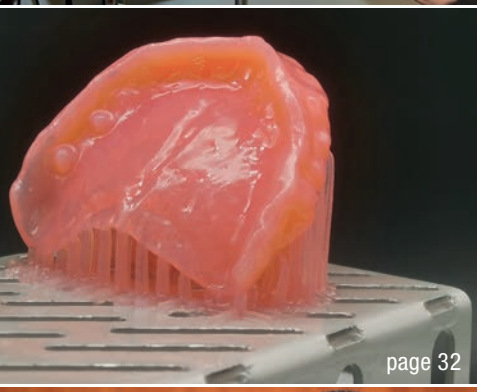
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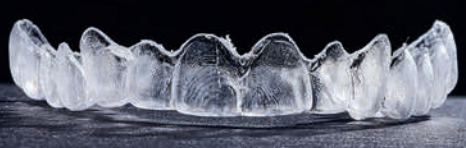

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Dental 3D-printing market to reach almost US$8 billion over the next few years

By Anisha Hall Hoppe, Dental Tribune International

3D printer manufacturers have a period of substantial market growth to look forward to in the coming years. A global forecast published in March prophesied significant changes for the dental 3D-printing market, including a complete doubling of market value by 2027. This exponential boom is fuelled by patient demand for same-day 3D services that require in-house printing, by increasing rates of clinic consolidation, by a growing geriatric population around the world, and by a skyrocketing incidence of caries and related diseases.

More in-house services offered

Valued at US$3.2 billion (€2.9 billion) in 2022, the dental 3D-printing market is expected to reach US$7.9 billion in value in the next five years. Printers utilising light-curing processes continue to provide the most popular 3D-printing method for dentistry, as medical standards require detailed products produced with high precision.

A comprehensive product round-up by 3Dnatives confirmed that major printer manufacturers are prioritising the development of printer solutions that provide not only high-quality custom deliverables to patients but also product lines that are tailored to a clinic or laboratory's unique size and set-up. This means practices can offer patients same-day solutions that are printed on-site, and laboratories can save dramatic amounts of space, as models are now saved digitally instead of being stored for future reference.

The consolidation effect

According the American Dental Association, group practice affiliation managed by large dental support organisations (DSOs) is on the rise. Over one-tenth (10.4%) of dentists in the US in 2019 were part of a DSO, a 2.4% increase in just two years. These figures coincide with a steady drop in practice ownership, down to 73.0% in 2021 from 84.7% in 2005. This trend is likely to continue as a survey of students leaving dental school in 2020 showed that 30% planned to join a DSO, up compared with 12% who planned to join one upon leaving dental school in 2015.

Henry Schein cites a 14% rate of growth for large dental groups over the last ten years, far outpacing general dental spending which grew at just 2–4% per year. Market research confirms that a continual push to digitise practices and the growth of corporate chains are still promoting growth in the 3D-printing market.

In addition, the Association of Dental Support Organizations explains that many dentists are choosing to join a group practice instead of striking out on their own. It says: "Greater buying power and the ability to negotiate with vendors helps DSOs lower dentists' supply costs. DSOs also help provide access to the capital dentists need for the most modern equipment, and to help support their practices." Initial investments in 3D-printing equipment can be more than what new dentists and small private practices are able to afford, particularly when many are already shouldering the costs of digitising their practices in other ways. Joining a larger practice or group means access to more capital for innovation and more manpower to manage new 3D-printing programmes.

A digital tooth fairy

Research by the American College of Prosthodontists (ACP) indicates that, at the present time, at least 36 million Americans are edentulous. Global rates of edentulism, whether partial or complete, are difficult to calculate, but a paper published in *Nature* holds the global prevalence to be about 7.6% and states that numbers vary dramatically depending on the country. Age is a significant factor; just 2.8% of individuals under 50 suffer some form of tooth loss and 14.0% of those over 50 suffer from the condition.

Heightened rates of oral disease around the world are to blame, in addition to poor oral hygiene and bone loss. Because these diseases also degrade existing teeth, 3D printers are crucial for providing solutions for restoring the dental structure with patient-specific dental prostheses and implants. It makes sense that 3D printer sales are on the rise, and ACP reported that about 2.3 million implant-supported crowns are manufactured just for Americans each year.

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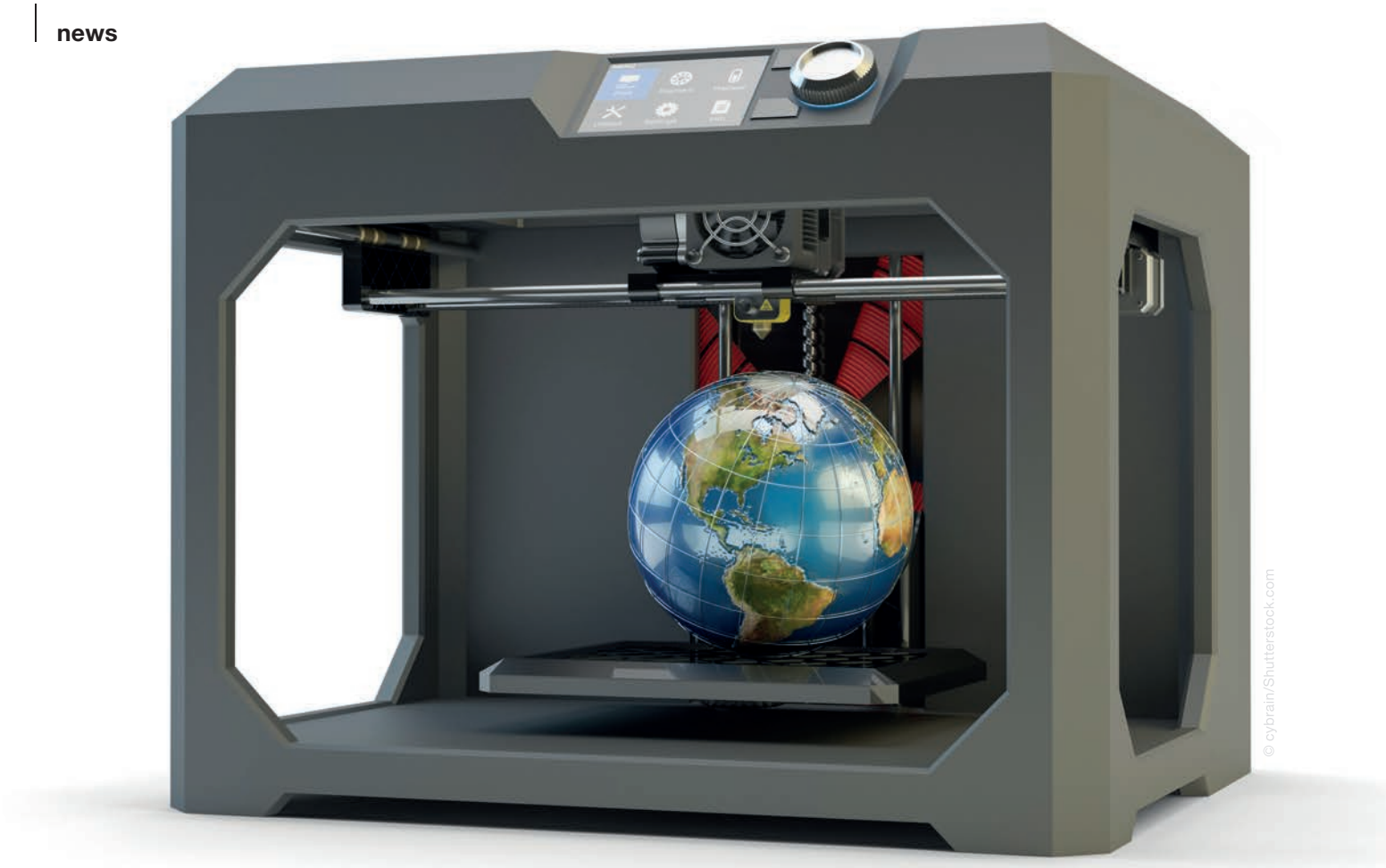

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The global dental 3D market is projected to double in size in the next five years.

Changing population make-up

In addition, edentulism is on the rise owing to the growing geriatric population, and the World Health Organization predicts that the global number of people aged 60 and older will double to 2.1 billion by the year 2050. The incidence of dental diseases and the need for supplementary dental fixtures are directly connected to the health effects of ageing.

To more efficiently address the needs of their ageing clientele, many dental practices are making the transition to 3D-printed options like digital dentures, thus completely eliminating the need for nuisance moulding, messy manufacturing and long wait times. From the first 3D scan to the final 3D print, the change to digital also means that dental laboratories can completely reconfigure their formatting, as 3D printers take up far less space than prep rooms and storage areas for bulk materials.

Beauty is a priority

As the world transitions out of pandemic mode and back to safe in-person interactions, more dental practices are once again offering procedures that, for the past two years, have been deemed non-essential, such as cosmetic adjustments. Aesthetic solutions like whitening, veneers, recontouring and tooth alignment are more frequently requested by patients the world over as well.

Preventative dental care treatments are being sought by patients in tandem with cosmetic procedures and appliances. More dental practices are beginning to offer aligner solutions and are either opting to outsource orthodontic consultations to a larger company or are handling treatment in-house, including production and self-branding of aligners, thanks to their own 3D printers.

The growth is not universal

According to the global forecast, there is already ample evidence that the dental 3D-printing market is recovering in North America and Europe, but the Asia Pacific area is struggling to regain footing. However, as more practices are turning to digitalisation everywhere, even the slowdowns experienced in China and India are expected to abate in the next couple of years.

One drawback that practice owners have noticed is that, even though they may have invested in a 3D-printing set-up, it is difficult to find employees having the skills needed to run it or to provide the appropriate training for existing employees. In response, more 3D printer companies are aiming to provide improved training resources in addition to their product lines.

Editorial note: The global forecast was published by MarketsandMarkets and can be accessed online at www.marketsandmarkets.com/Market-Reports.

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