issn 2193-4673 • Vol. 3 • Issue 1/2022

1/22

digital

international magazine of digital dentistry

interview
Digital dentistry trends for 2022

case report
Digital workflow for partially edentulous mandible

feature
Why does dental practice design matter?

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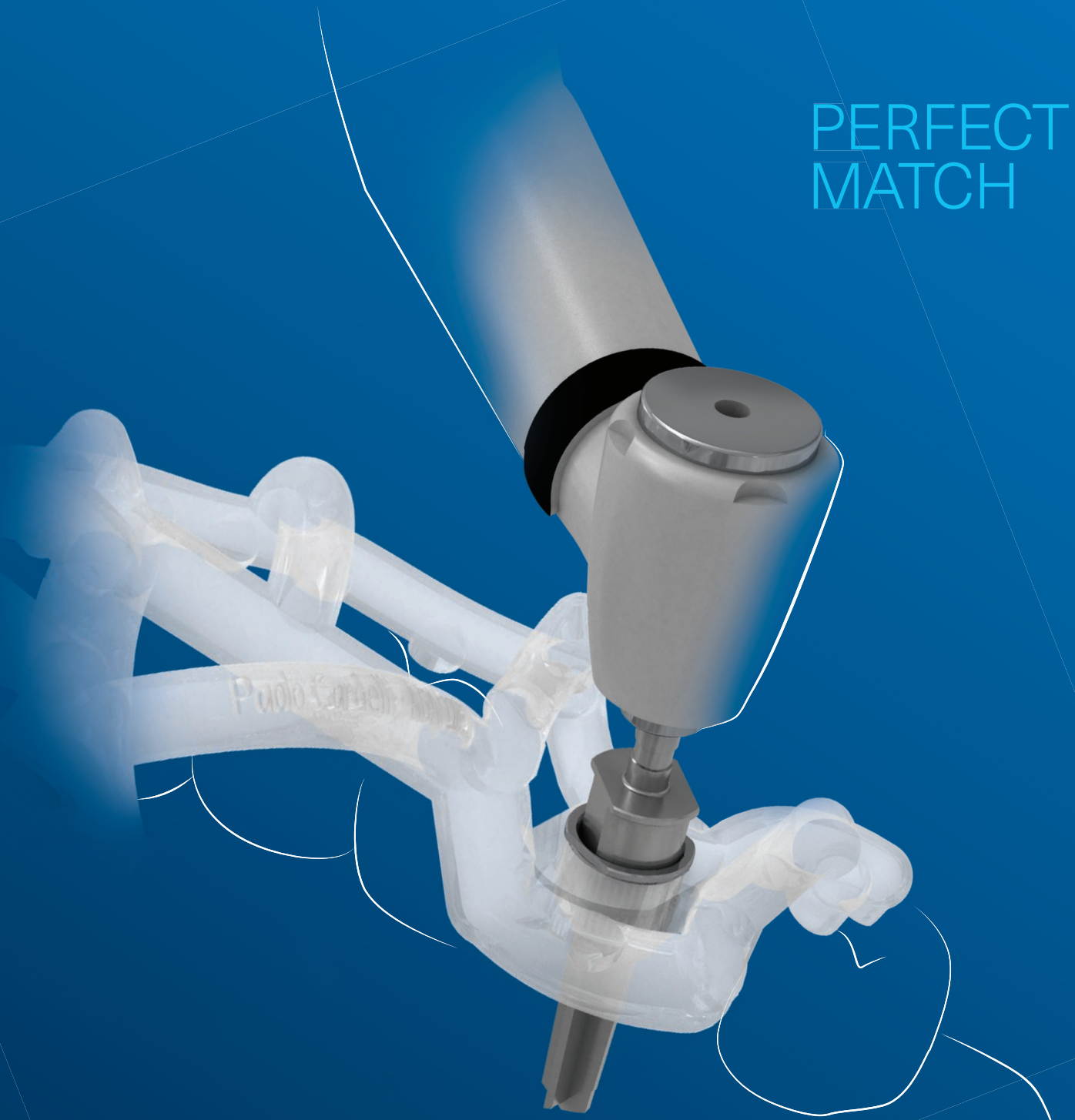

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Dr Scott D. Ganz

Editor-in-Chief

Tools of the trade

What are the essential ingredients of the provision of state-of-the-art care to patients? While this may be very general and difficult to quantify, is there a general consensus on what technology is important for a variety of practice scenarios? Let us consider the process from the beginning, diagnosis and treatment planning. Many clinicians made the transition from analogue to digital radiographs many years ago. Yet, many are still using film for periapical and/or panoramic radiographs, creating a static image from which to make treatment decisions. Digital radiography has many features, but perhaps most important is the ability to interact with individual images regardless of the software application that is utilised. A static film is viewed as it is on a light box. It is not possible to change the contrast, brightness or sharpness or to zoom in to an area of interest as we can with a digital image on an LCD computer screen. The ability to interact is the key concept to understand. It is the interaction that helps expand the clinician's insight and vision in order to diagnose and assess a patient presentation accurately.

As technology has evolved, so have the intra-oral sensors that capture the images and there have been leaps in computing power to process the data with advanced graphics hardware and software. Desktop computing has remained important for most clerical everyday practice management, but has been largely supplanted by the portable and very powerful laptop computers which now play a major role in most dental offices. Portability has become important for many applications, including digital radiography and now the ever-growing popularity of intra-oral scanners, which require a powerful computer to function properly. Therefore, we are no longer tied to one operatory with either digital radiography or intra-oral scans. The only exception within our digital workflow, especially for those placing dental implants, is the CBCT device, which requires its own space within an office environment. The use of digital radiography, intra-oral scanning and CBCT provides clinicians with the necessary digital information to diagnose and plan treatment properly. The issue however is not the physical equipment or the software that is available; it is the individual clinician's ability to assess, interact and interpret the unique patient data so that treatment recommendations can be presented to the patient. Therefore, while we have different tools of the trade, it is the essential knowledge base that helps us understand what the data represents and how to use that data for the benefit of our patients.

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Dr Scott D. Ganz
Editor-in-Chief

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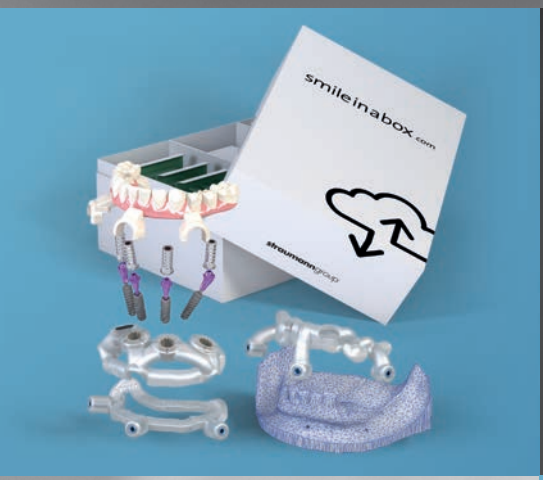

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Digital Solutions

Ethical guidelines missing in field of dentistry and AI, researchers say

By Luke Gribble, Dental Tribune International

Dr Carl-Maria Mörch

Dr Maxime Ducret

Maintaining high ethical standards within the medical profession is key to providing the best care possible. The doctor–patient relationship is sacred, and the information exchanged between these two parties is based on a high degree of trust that the practitioner is prescribing the proper treatment for the right reasons. The integration of artificial intelligence (AI) in dentistry is now prevalent, and there seems to be a third party entering this sanctum of trust. In a recent study investigating ethics and the use of AI in dentistry, researchers revealed that much work is still needed to ensure that dentists better understand the technology they are using and that patients and their data are protected.

During a recent discussion with Dental Tribune International (DTI), lead researchers Drs Carl-Maria Mörch and Maxime Ducret spoke about their study, about the still under-researched topic of AI and ethics in dentistry, and about the challenges that the field is facing. Dr Mörch is the scientific manager at FARI—AI for the Common Good Institute in Brussels in Belgium and a researcher at the Université Libre de Bruxelles, and dentist Dr Maxime Ducret is associate professor in prosthetics and digital dentistry at the Université Claude Bernard Lyon 1 and a hospital practitioner at the Hospices Civils de Lyon.

"One of the major issues is around transparency and the lack of explainability regarding the technology dentists are using," said Dr Ducret. "We have more and more dentists adopting in their practice technology that uses AI but many do not fully understand what it is they are using," he continued. Adding to that, Dr Mörch pointed out that there are currently around 100 sets of ethical guidelines for the use of AI across all sectors. "They are everywhere. They are mentioned in the news, and the EU has its guidelines. However, when we look specifically at dentistry, there is no mention of a code of ethics related to AI that a dentist can follow," he explained.

This limited understanding creates unforeseen risks. However, as stated in the study, those risks have been around for some time and little has been done. In the study, Drs Ducret and Mörch noted: "The frequency of publications mentioning ethical issues related to AI has not increased since 2015 and remains low, highlighting a potential lack of interest in this topic." They added that some ethical issues around big data and digital technologies have been addressed but there has been little examination of AI's ethical issues and its introduction into a practice setting.

One explanation for this gap in the research could be a lack of training and education. "As a patient, we expect a dentist to know what the limitations of a certain tool or technique are, and so it should be expected that dentists know the limitations of the technology they are using too," explained Dr Mörch to DTI. "Practitioners receive training in a huge range of areas but have never had an introduction to, or classes on, the ethical issues around AI." When an algorithm is used, for example, to examine a radiograph and sometimes suggest costly procedures, dentists must know exactly how the AI reached its conclusion and clearly communicate this to the patient, explained Dr Mörch. At the moment, the researchers believe that lack of understanding could mean that there is also a blind spot regarding the risks AI can pose, and thus, interest in this issue is limited.

This lack of education has prompted researchers to begin developing guidelines to help dentists better prepare for the future. "There is no such thing as a universal tool that can suit academics, practitioners and researchers. Even in universities, you can have several fields working within dentistry, so there is no one-size-fits-all," said Dr Mörch. However, the idea behind this work is to see whether dentists can recognise the ethical risks that might arise when put into theoretical scenarios and glean certain guidelines from those resonances. When asked how dentists could start improving their knowledge of ethics right now, Dr Mörch

explained that practitioners could begin by asking more questions about how manufacturers of certain types of equipment arrived at their conclusions and what the implications might be for their patients. “Be aware regarding what the technology says it can deliver and what the results are, and if it is not clearly improving care, then remove it,” added Dr Ducret. “The chain of responsibility is also critical. In the case of a malpractice event, the question is, who will be held responsible? Before implementing these tools, one needs to know where responsibility lies,” continued Dr Mörch.

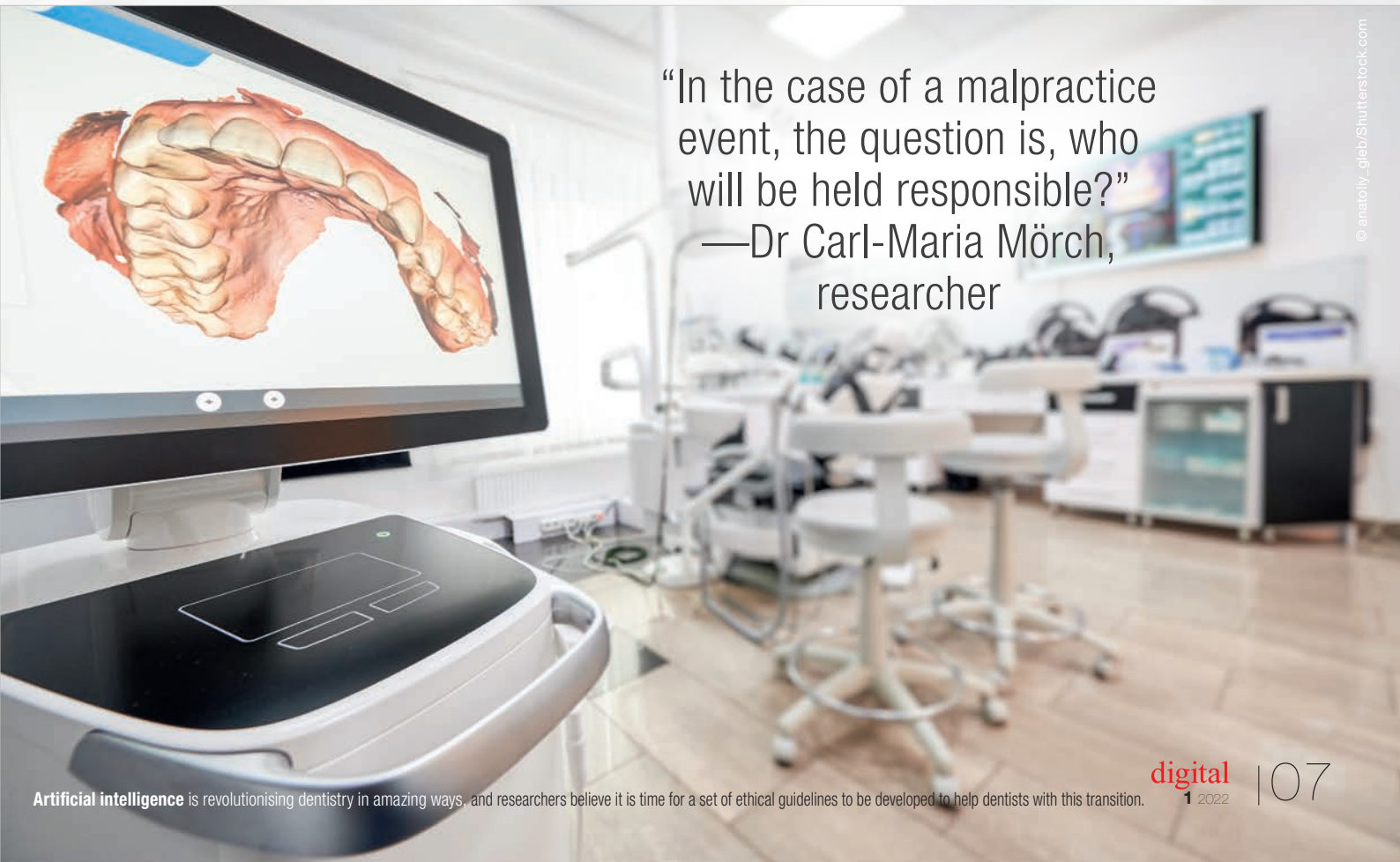
Additionally, the researchers noted in the study that sharing data could help create more transparent and understandable technology from which everyone from the patient to practitioner and manufacturer could benefit. “It is pretty simple to say, but sharing data and the benefits is challenging in reality,” admitted Dr Ducret. However, he continued: “There are many questions around data security and intellectual property (IP), but the point we wanted to make is to try and reduce the time, expertise and energy currently used to make progress in the field, as it clearly lacks sustainability. We want to encourage a type of dentistry that does not try and promote again and again a novel solution by starting from zero, and there are ways to collaborate without losing IP, not only in the field of research but also within industrial groups.”

Along with transparency and education, there are other serious ethical questions around the development of new technology that need to be considered, the researchers said. One of these is about the collection of patient data that could then be used to develop new algorithms and sold back to patients in the form of a new procedure or piece of technology. “I think people are not aware the way current AI solutions are developed, and dentists need to be responsible for telling patients what might be done with data that is collected,” noted Dr Ducret.

AI has the potential to revolutionise dentistry in far greater ways than it has done so far. However, according to the researchers, the question is how this new technological era should be optimised in order to provide the best oral healthcare possible. “In our paper, we try to highlight some questions that those in the field may need to discuss in the coming years. For now, we do not have a perfect solution, but people need to think about it,” said Dr Ducret. Adding to that sentiment, Dr Mörch noted, “Right now the technology requires a high level of knowledge, and if insufficient effort is put into the training of practitioners and researchers, we will end up with a field that is illiterate regarding the equipment they are using. We should know and be responsible for all the techniques we promote, use and teach in healthcare.”

The researchers believe the question of whether industry, practitioners and patients can come together to find a way to integrate AI in a safe and sustainable manner is one of the most critical challenges facing dentistry today. If it is not addressed soon, they are concerned that the sacred doctor–patient relationship could one day be damaged beyond repair.

Editorial note: The study, titled “Artificial intelligence and ethics in dentistry: A scoping review”, was published on 21 June 2021 in the Journal of Dental Research.



“In the case of a malpractice event, the question is, who will be held responsible?” —Dr Carl-Maria Mörch, researcher

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Artificial intelligence is revolutionising dentistry in amazing ways, and researchers believe it is time for a set of ethical guidelines to be developed to help dentists with this transition.

FDA approval marks major step for Second Opinion AI software

By Jeremy Booth, Dental Tribune International

Second Opinion, an artificial intelligence (AI) diagnostic tool that assists in dental radiography, has been cleared by the U.S. Food and Drug Administration (FDA) for use by dental professionals in the country. This milestone follows the recent approval of the software by health regulators in Australia and New Zealand and the granting of the European CE mark. The software was developed by Pearl, and the company's founder and CEO, Ophir Tanz, said that the clearance was a major step for dentists, who are now free to shift into the AI paradigm in their everyday clinical practice.

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Pearl is a leader in developing AI solutions for use in dentistry, and its Second Opinion tool is a real-time pathology solution that assists dentists in accurately detecting and diagnosing common dental conditions using dental radiographs. A computer vision platform that can identify and measure an array of pathologies, the software highlights potential areas of interest and provides dentists with a second set of eyes.

The FDA cleared the software in early March, and a press release from Pearl explained that the agency's strict efficacy requirements had been exceeded by the clinical studies that formed the basis of the company's application for market approval.

In total, Pearl submitted four clinical studies to the healthcare regulator, and each of the studies featured a dataset of more than 2,000 images that were interpreted by dozens of expert dentists and radiologists. Pearl said that the studies showed clear advantages for the experts using Second Opinion software. Those who had used the AI software had identified 36% more lesions than those who had worked without AI assistance.

The company said that the FDA clearance marked an important step in the adoption of technology-assisted dental care. Tanz commented in the press release: "This clearance is a major milestone not only for our team and for the many dentists, advisors and partners who have contributed to Second Opinion's development, but also for dentistry itself." He explained that AI-assisted technology brought with it a paradigm-shift in dental technology that he said would add value across the entire healthcare sector. "Because x-rays are a regular part of every dental patient's experience, the first place most people will encounter the power of medical AI technology will be in their dentist's chair. Second Opinion's FDA clearance has made that possible," he added.

Prof. Markus Blatz, a key opinion leader in restorative dentistry and digital innovation, said in the press release: "The benefit that Pearl's AI brings to patient communication in the dental operatory—and the trust that follows—cannot be overstated, and it is in that area that Second Opinion's impact will be most immediately felt."

Pearl's co-founder and chief technology officer, Cambron Carter, added: "State of the art algorithms that currently assist in the detection of cancerous lesions can now be applied to detect many more frequently occurring dental diseases. The standard of care in dentistry is about to level up."

Speaking to Dental Tribune International, Tanz predicted that, as dental patients reap the benefits of AI-assisted technology, dentistry itself would become a model for the rapid adoption of AI in other medical fields. "So, at the same time as today we welcome the future of AI-powered dentistry, we also welcome an AI-powered future for all of healthcare," he said.

In October last year, Second Opinion was provided with market authorisation by Australia's Therapeutic Goods Administration and New Zealand's Medicines and Medical Devices Safety Authority. Earlier in 2021, it received the European CE marking, and it is already being used daily by dentists in North America, Europe, Australasia, South America and the Middle East.

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