AI ETHICS

How Your Teeth, Your Smile and AI Ethics are Related

By Maxime Ducret, Dentist and Associate Professor, University of Lyon and Carl Mörch, Co-Manager, FARI - AI Institute for the Common Good

In this module, Maxime Ducret and Carl Mörch discuss the ethical implications of the use of AI technologies in the field of dentistry. While medical practices are generally carefully regulated, Ducret and Mörch find that there is little consideration for the ethical challenges currently present in applications of AI in the sector. They explain some of the potential repercussions of this gap and offer a framework of questions that practitioners can use to evaluate the ethical implications of their AI systems specific to this intersection of medicine and technology.

Lecture Transcript

Mörch 0:00 Hello everybody, my name is Dr. Carl Mörch. I'm a researcher in psychology, specialized in the ethical challenges of using AI in mental health and in healthcare in general. I'm also the co-director of FAIR - AI for the Common Good Institute, a joint initiative of two universities here in Brussels.

Ducret 0:17 Hi, everybody. I'm Maxime Ducret. I'm a dentist and professor in the University of Lyon in Dentistry and Prosthodontic Dentistry. And today we want to try, together, to discuss this question: How your teeth, your smile and AI ethics are related?

Mörch 0:33 These concepts and notions may seem completely separate. We will try to see how they are indeed connected. As you know very well AI, data and robotics are increasingly used in healthcare and are transforming the field. Dental Medicine as well is now deeply impacted. And in the context of what we could call an enthusiastic adoption with many promises and hopes, we are asking a question today: are we being cautious enough? Are your dentists, health authorities, companies, professionals aware of the inherent challenges legal, technical, scientific that might come with these technologies.

Ducret 1:09 Okay, so let's first discuss about the digital transformation that we have in dentistry. So on my side, as a dentist, I have more and more devices that are proposed to change my practice. But there are also some tools that are proposed for the patient to improve their health. So as you can see here, as dentists, we have now a device that is called the Intraoral Scanner, and that we can put in the mouth to register the form of the teeth. And you can also know that there is already some AI tools that are present inside the intraoral scanner to improve the scan. But there is also some software that could be proposed to detect the decay in the mouth.

Ducret 1:58 There is also a new tool that is proposed that is called the CB [Cone-beam] CT. And it's able to scan, to register all the bones and the teeth that we have in the mouth.

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And thanks to my colleague, the Professor (dr) Reinhilde Jacobs from the University of KU Leuven, you can see here that artificial intelligence could help to segment the different bone and the teeth that will help to prevent any risks during the clinical intervention.

Ducret 2:26 And the last thing, it's about the prosthodontic laboratory, because we have a couple of people that helped the dentists to create specifically some prostheses and artificial intelligence. It's proposed for example here to create new smile, smile design, but there is also software that proposed automatic creation of the removal of partial dentures using artificial intelligence. And specifically to the smile design. We can see here on this video, a software that is able to propose automatically and simultaneously the new conception and new smile to the patient on the iPad. But beyond the wow effect, I think there's a couple of questions that we have to discuss.

Ducret 3:20 And together with Carl and the rest of the team, we were interested about all the questions, the ethical questions, that could be related to the development of artificial intelligence in dentistry. And what we have observed and we have more and more software, more and more solutions that are proposed. And it's about all the clinical applications that we have in the field of dentistry. And as you can see here, specifically in the field of dentistry, we have a couple of applications like prevention, diagnostic and a couple of specialties, but we have the feeling with Carl that everything has to be organized clearly, and ethics. It's something strong that could surround all this application, and could help to promote strong and powerful artificial intelligence in dentistry.

Mörch 4:14 With new tools, come new practices and also new challenges. As you might know, the field of healthcare is heavily regulated and subject to numerous guidelines, deontological rules of health professionals or researchers, we have to follow many guidelines. AI itself also comes with its own ethical principles, dilemmas, and you might know that over 200 guidelines have been written in the past few years in all sectors, from all different stakeholders, from public to private, to NGOs to international organizations. Their goal was to contribute to a responsible development of AI. AI is implicitly and supposedly requires its developers now more and more to think about the related challenges before developing or implementing AI systems.

Mörch 5:00 There might be now what we could call a contradiction, because when we investigated today's uses of AI, we also looked for mention of ethical challenges in the literature in dentistry. We really wanted to know and answer a specific question. We talk a lot about AI ethics nowadays, but are there specific challenges that AI raises when it comes to dental medicine? Is there a specificity when using these types of technologies for this application and field? Surprisingly, as you can see below, we found almost no mention of ethical issues. Therefore, we were asking ourselves a series of questions: how to explain it? What is missing? How is it possible that on one side, we have 200 guidelines with many, many rules, principles, and on the other side, when we look at dentistry, we can see that all the AI papers that were published, barely mentioned ethics? So our hypothesis is maybe that there is a lack of sensitization, maybe a lack of awareness, or a lack of training more formally. Looking at the future, we are also wondering how to ensure that patients' future dentists and researchers are aware of the ethical limitations, challenges of these tools. We believe, today's trainings are maybe not insisting enough on what does it mean to use a digital tool such as AI system, when you want to use it to help people and to try to better understand health conditions. There is still a long way to go in our honest opinion.

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Mörch 6:32 We could also think that we might, are, now creating a double standard. Because AI has so many, brings so many hopes and promises. We are maybe overlooking the ethical challenges that could be another explanation of why we barely see dimension of ethical challenges in the AI literature in dentistry. But by comparison, we expect that a doctor knows what a diagnosis tool is for and what it can and cannot measure. We also expect a contractor redoing something in your house to know which material to use, in which conditions, what are the safety hazards. We expect to mechanician to know what is an adequate repair, the appropriate tool, the advantages and downsides of some parts over others. So why are we now accepting that maybe dental researchers or practitioners are using AI without really knowing its limitations and potential challenges?

Mörch 7:25 That maybe leads to the question of inflated expectations when it comes to AI. As you can see on the Gartner chart and curve on the right. We might have reached what we could call and what has been called the peak of inflated expectations. Hopes. promises were so big that we rushed to use these technologies without really looking at all the different challenges that come with them. This peak of inflated expectation could lead to several risks. The first one is a lack of information on the quality of evidence. Again, we really rushed to use these technologies. And we did not really do all the proper work that goes beyond and behind to really document all the use of this technology. The second aspect is maybe that it leads to less transparency, because again, we want to use this technology, we want to make experiments, we really want to try to develop applications, maybe we don't have the time to also document and be completely transparent about everything that goes behind the scenes.

Mörch 8:23 And maybe the last aspect that is also critical to us is the lack of hard ethical standards, can be related to peak of inflated inflated expectation, because all the efforts and investments go into helping the development of the technology, maybe we're not looking at how to also limit its use, how to also channel and control and regulate it. And right now we have a lack of hard ethical standards. And we have what has been called soft ethics, meaning non binding. Most of these 200 guidelines are maybe not legally enforced and are still not yet legally enforced. By not being cautious enough, we think that this could accentuate the entry into what has been called the trough of disillusionment, meaning that after seeing many many misuses of AI, we might end up also thinking, well, this is maybe disappointing, and it's a disappointing technology that we mentioned, maybe steer away from. So to really seize the full potential of AI and to also understand it as a tool with its own limitations and also its own benefits, we maybe need to ask ourselves a series of AI ethics questions. So this is our proposal to you today - is to maybe try if you want to use AI in dentistry to think of a series of AI ethics questions. The first one is data handling. It's a key question when it comes to AI systems you always start with where is the data coming from? What data will we use? But the other questions that are related to it and also ethics are: are there third parties? Is the data of the app that you're using with your patients sold to also other third parties, companies and data brokers?

Mörch 10:00 Another aspect that seems far away from ethics is technical and cybersecurity. What we mean by that is there are technical questions that underline, are related to ethics. For instance, are we dealing with a really an AI system? What we've seen is that a lot of organizations, companies, and people pretended to use AI, when it was indeed something far more simple or just a regular software, but not a very set of advanced technologies. So for us, it's important to know, are we dealing with a true AI system or with something else? This might lead to completely different questions. And then in healthcare, we also have many questions that AI raises that are very specific. So for instance, in the example of the smile design app that Maxime was showing, if you're being presented as a client or a patient, a new vision of what your teeth could look like that looks very promising, very

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engaging, are you really going to buy into these expensive treatments? But ask yourself the question, what if the system was actually misleading and not doing an accurate representation? Or maybe doing some mistakes in the back? And what if your teeth cannot look like the representation that were shown to you by the AI system? This is a key issue here that is completely deontological, meaning that it could lead to malpractice that would be legally punished.

Mörch 11:22 And then social issues. Many systems will use, for instance, facial recognition, or be trained using specific datasets from maybe related to specific populations or subgroups of the population. And we want to also ask ourselves, are there are biases inherent to these datasets being used to train the AI systems used in dentistry? Does it target vulnerable groups? Does it include them or not? These are also key questions. And finally, the most important one also to us is the question of the reliability and the efficacy and accuracy of the systems is key. We are in healthcare, and we want to know is this tool actually being efficient. And we have right now a lack of evaluation. And it is actually a key problem for us from a scientific and an ethical point of view.

Mörch 12:12 Let's not forget sustainability is also a key aspect that we want to underline with Maxime. Sustainability is not really well considered when it comes to AI and we still are waiting for more documentation and literature and evidence on how polluting are these AI systems? We know that training one AI system could lead to the pollution equivalent to the use of five cars across the lifespan. So we really want to know are the tools that we use and develop or promote in dentistry are polluting? And do they have an ecological impact? And these are key questions nowadays to wonder ourselves.

Ducret 12:49 So now we have for you four key messages that we want to synthesize for our presentation. It's our proposition. It's only based on our experience and the publication that we found but we strongly think that for any field, you have to identify if there is already guidelines to develop responsible AI, artificial intelligence. If you have a project, and if you want to start something new, you have to starting asking what could be the societal and ethical impact of the features system or software that you put that to, that you plan to develop? You have to propose more education for ethics. And for example, you can promote the global ethics initiative. And finally, when you want to create something new, you have to include other profile, and specifically the main stakeholder in the conversation to ensure that the proposition, the software, the new artificial intelligence that you want to create would be systematic and sustainable.

Mörch 14:08 We wanted to thank you for your attention. And we wanted to show you starting with our own research and work that what you observe in Dental Medicine is actually bringing the question of AI ethics more and more, and we hope you enjoyed this presentation. And don't hesitate to reach out to us using the two email addresses that you can now see.

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