

## From Mindless Mechanic to Educated Educator

Over the last 100 years, the dental profession has undergone incredible progress to address problems created by oral disease. Our ability to restore function and esthetics efficiently and predictably via modern restorative materials, regenerative treatments, dental implant therapy, and digitally driven workflows is truly remarkable. For those members of our profession privileged to work in fully developed economies, the prevailing perception is that the war against caries, periodontitis, and edentulism has been largely won. There has surely never been a more exciting time to be in dentistry. Thus, it may sound paradoxical or even alarmist to state that dentistry is falling behind in its mission to serve the needs of our patients—but it is.

Some research and data sets from the past several decades made us believe that we had deciphered the mechanisms that drive the demineralization of tooth structure and periodontal tissue destruction induced by inflammation, making it only a matter of time before disease incidence would be limited to patients with suboptimal dietary habits, poor oral hygiene, uncontrolled diabetes, and smokers. Unfortunately, this is far from the current reality, and this editorial is not the first to sound the alarm. As far back as the late 1970s, Dr Brian Burt<sup>1</sup> encouraged a more nuanced understanding of the etiology of edentulism and dental caries, while discussing the multifactorial nature of dental disease and its management within dynamic societies. In the late 1980s, Dr Anders Thylstrup<sup>2</sup> provided insights that could be easily published in 2024 with no modifications. He lamented, as previously identified by Dr G. V. Black in 1908, the continued disconnect of the “dental mechanic” from the science guiding the prevention and management of dental caries, and he astutely highlighted the negative results

produced by a lack of patient-centered, individualized care.

A current look at the United States, which has by far the highest per capita expenditure on dental services in the world,<sup>3</sup> provides a sobering perspective. Comparative data published by the US Centers for Disease Control and Prevention in 2019 shows that although improvements have been made in reducing caries prevalence and untreated caries in young populations, over 50% of school-age children still experience dental caries, with no changes in adolescent caries prevalence in permanent teeth since 1999.<sup>4</sup> While modest improvements have been made in rates of tooth retention, over 90% of the adult population in the US still experiences caries, with the prevalence of caries in older adults actually increasing from previous levels.<sup>4</sup> Meanwhile, less than 50% of Americans (children or adults) utilize dental services on a yearly basis.<sup>4</sup> To paraphrase Dr Peter Milgrom, US dental health care providers spend a majority of their time overtreating and excessively monitoring healthy dentitions while failing to address the prevention and treatment of dental disease via individualized therapy for those who need it most.<sup>5</sup>

Similar trends are reflected in global data. A report on the global health burden of dental disease from 2005 identified that while dental caries prevalence among children had declined in highly developed countries over the previous 20 years, it was significantly increasing in developing economies.<sup>6</sup> Moreover, dental caries affected nearly 100% of the adult population in most countries, regardless of economic development status. Further data suggests a reversal of gains made in caries prevalence decline, even in developed economies.<sup>7</sup> Research from 2015 reiterates the same findings: Prevalence of oral conditions such

as caries and periodontitis remained virtually unchanged from 1990 to 2015, with a dramatic increase in untreated disease driven by population growth and aging.<sup>8</sup>

If the dental profession does nothing to correct course and trends continue, simple math suggests that even in the most developed economies with the greatest resources and access to care, population growth and increased life expectancy will push the prevalence of dental disease to ever higher levels. Indeed, 2015 data on the global burden of oral diseases indicates that this may already be the case.<sup>9</sup> Meanwhile, most of the global population does not live in a developed economy but rather in abject poverty.<sup>10</sup> Fortunately, this is changing; over the next 50 to 100 years, current economic trajectories are expected to significantly reduce the prevalence of extreme poverty worldwide.<sup>10</sup> Establishing the infrastructure, resources, and care providers to facilitate access to quality care is a major challenge even in the most developed economies. If changes in oral disease prevalence mirror historical trends in developing economies,<sup>6</sup> the movement of a majority of the world from extreme poverty into more developed economies is likely to exponentially magnify these challenges globally.

Although we practice in an era in which “evidence-based dentistry” supposedly drives patient care, the foundational principles upon which most providers make their daily clinical decisions are not as scientific as they generally tend to believe.<sup>11</sup> Many current dogmas in dentistry are, in fact, based on small data sets, outdated armamentaria, and inefficient clinical protocols. Our profession has continued to be exceedingly myopic since the time of Dr Thylstrup’s observations (or those of Dr Black, for that matter), focusing on surrogate laboratory and clinical outcomes that are limited or useless in their ability to predict long-term success, from either a practitioner or a patient perspective. First, we need to recognize that the most influential factors on therapeutic longevity are not workflow- and armamentarium-related but operator- and patient-related. We must refocus on what matters most. Developments in techniques and materials to treat the sequelae of dental disease have caught our attention for far too long

now, attaching our identity as oral health care providers to the acts of diagnosing a deficiency in the dentition or the periodontium and repairing said deficiency. This distracts us from what is by far our most important role as dentists: advisors and educators to our patients.

In the age of digitization and artificial intelligence (AI), ironically what dentistry lacks most is investment in human capital. AI and digital workflows are changing our ability to diagnose and treat patients for the better, with more precision and predictability than we are capable of without technology. But the use of technology does not touch the core of what is most important in caring for our patients: the human factor. It is important for us to leverage the best tools we have to create proficient operators capable of performing technical tasks at the highest possible level. But it is even more critical that we develop dentists who can connect and communicate effectively with patients while understanding how best to combine their available armamentarium, skill sets, and knowledge to address patient-specific needs. All the investment in the world into digital technologies and AI cannot replace the critical human interaction that drives successful outcomes when doctors are advising their patients about managing their oral health over time or interacting with their patients in a meaningful way to educate them. Understanding the true etiopathogenesis of oral diseases and how patient-specific factors influence those processes is important, but not enough. If we do not effectively influence patient behaviors to prevent the onset of, and mitigate the effects of, disease and physiologic changes related to aging, it does not matter what novel solutions are developed to address existing deficiencies in the dentition and surrounding tissues. We will always be behind the curve. Our efforts should be concentrated on developing researchers and clinicians able to generate and evaluate solid evidence, appropriately use their armamentarium, understand the significance of patient-related factors, and think critically to apply their knowledge to specific clinical situations. Then, and only then, will we approach our maximum potential in optimizing the outcomes of care.

The efforts of the global dental community in the 20th century to improve the lives of patients were admirable, and significant progress was made. There is plenty to be proud of and optimistic about. Furthermore, unlike 100 years ago, we have an incredibly connected global community with which to generate new ideas and collaborations; we have access to technologies that facilitate more accurate data collection and provision of care; we can evaluate and monitor clinical data sets on a scale that is unheard of in the history of our profession. With the right focus on rigorous scientific investigation of the etiologies and treatment of oral diseases, combined with concerted efforts to develop critically minded clinicians focused on patient education and guidance, we should be able to meet the challenge that the next 100 years will present us. That is, of course, with the understanding that we should develop healthcare systems that encourage patient engagement and participation, give access to individualized care to all those in search of it, and motivate practitioners to be educators and advisors first, instead of just “hole pluggers” or “tooth pullers.”

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