COVID-19: Smoking cessation and the science of dissemination and implementation in dental care.

COVID-19: Dejar de fumar y la ciencia de la difusión e implementación en la atención dental

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Smoking tobacco is understood as an action taken by an individual associated with the burning and inhalation of a particular plant (the tobacco dried leaves). Tobacco can be smoked in cigarettes, cigars or pipes. Smoking differs in the depth of inhalation, puffing style, and frequency of smoking. According to the World Health Organization this behavior has killed around 8 million people each year and 7 million of those deaths are the result of direct tobacco use, while more than 1 million are the result of second-hand smoke.

Around 30 years ago tobacco use was officially identified as an addiction. Tobacco use therefore emerged as a policy focus through pulmonology medicine and epidemiology rather than psychiatry. The growing characterization of smoking as a manifestation of nicotine addiction was connected with the development of research on the pharmacology and biology of smoking in the 1980s.[1] Nicotine is an alkaloid derived from tobacco plants which binds to the cholinergic nicotinic gating site on cationic ion channels in receptors in the human body. After this action a variety of neurotransmitters such as catecholamines and serotonin are released. When nicotine rapidly changes the levels of these chemicals in the body, mood and concentration levels change. Tobacco users find this pleasant because it modulates their emotions or other physical functions, especially when they are physically or mentally stressed.

Although nicotine is the addictive ingredient in tobacco, the harms associated with tobacco smoking stem primarily from the carcinogens in cigarette smoke (*eg*. tar, carbon monoxide) rather than nicotine itself. A new electronic cigarette or electronic cigarette was invented to lessen those effects in the smoking population. It consists in inhaling vapor (or "vaping") with protonated nicotine, rather than free-base nicotine. However, since e-cigarette smoking may cause upper respiratory tract irritation, dry cough, vomiting, burn injuries, release of cytokines and pro-inflammatory mediators, changes in the bronchial gene expression and risk of lung cancer, among others, its use should be controlled and prohibited to the younger population.[2]

Currently, evidence demonstrates patients with history of smoking and COVID-19 are 14 times more at risk to progress to pneumonia.[3] At the biochemical level, smoking can upregulate the angiotensin-converting enzyme-2 (ACE2) receptor, the receptor for both the severe acute

respiratory syndrome (SARS)-coronaviruses (SARS-CoV and SARS-CoV-2) as well as for the human respiratory coronavirus NL638. This upregulation could also apply to e-cigarettes. ACE2 could be a novel potential therapeutic target for the prevention of fatal microbial infections.[4]

Furthermore, smoking is harmful to the lungs in many different ways, an example is the susceptibility of smokers[5] to an increased risk of acute respiratory distress syndrome (ARDS). This syndrome presents with progressive arterial hypoxemia, dyspnea, and a marked increase in the effort of breathing, and other clinical disorders related to this syndrome include the associated non-pulmonary organ failure.[6] Respiratory failure from ARDS has presented secondary to COVID-19.[7] Smoking as a particular risk factor for ARDS, may increase the severity of this condition in people who have been affected by COVID-19.

Since the latest epidemics have involved different problems related to respiratory diseases, the creation and re-evaluation of the designs of programs for the use of tobacco and electronic cigarettes are mandatory in dental schools, in order to contribute to the general health of the population. Smoking not only affects oral, pharyngeal or periodontal tissues but it is an important risk factor for lung disease. An important tool to develop programs is the Dissemination & Implementation (D&I) science. D&I research emerged over the past 25 years[8] as a concept and through the years, different approaches have been part of this method, among them Cochrane reviews and other systematic review, to create clinical practice guidelines across different health sciences disciplines.

The D&I research involves the study of information distribution and intervention materials to a public health problem or clinical practice audience and strategies to adopt and integrate evidence-based health interventions into clinical and community settings, in order to improve patient outcomes and health care policies.

Dissemination research is a planned process that involves knowledge (research findings) transfer to different target audiences and settings. One of the main objectives of this process is to communicate and interact with policy and health service audiences, since this knowledge has a crucial role in the decision-making processes and practice. Some examples of theories used in dissemination research are diffusion of innovation, persuasive communication and knowledge-based view of the firm. Further, implementation research is focused on methods that improve the adoption and integration of practices based on evidence-based findings, interventions and policies into general health care assistance and public health systems.

One important role of this type of research is to identify barriers that impede to introduce effective health programs and policies. The implementation research methods include qualitative approaches (grounded theory, participatory action research, phenomenology, ethnography, case studies, interviews, focus groups, among others), quantitative designs (cross sectional surveys, networking analysis or longitudinal studies) and mixed methods. Experimental studies such as pragmatic trials, or practical trials (randomized controlled trials focusing on effectiveness of an intervention) also are used in implementation research. The main outcome variables in this research are acceptability, adoption, feasibility, fidelity, sustainability and scaling-up.

Through the years some dentists and dental hygienists have promoted smoking cessation in different oral health care settings, however, those efforts have not been permanent. For example, in the 1980's and 1990's a review found 2% to 34% effective rates of using different strategies such as tobacco counseling and pharmacotherapy (nicotine replace therapy).9 At the end of 1990's some experiments were reported from the dental school of University of Manitoba, who implemented tobacco-use cessation interventions in undergraduate curricula and general teaching clinic that were successful. They also obtained the inclusion of a dental fee code for tobacco-use cessation services and received approval to allow dentists who have completed tobacco-use cessation training to prescribe bupropion HCl (Zyban), in consultation with the patient's physician. However, a decade later in Manitoba only 37% of practitioners informed feeling adequately prepared to assist smokers in quitting smoking.[10]

More than 10 years later, in 2012, new research was reported such as tracking dental patient tobacco use in academic dental care settings. They observed that the "cold turkey" (to stop smoking abruptly without using any aiding products or professional support) approach was the most common cessation method and other common therapies were pharmacological in combination with counseling, among them the nicotine

patch, nicotine gum, varenicline (Chantix®), the nicotine lozenge, bupropion SR (Zyban), and a nicotine oral inhaler.[11]

In 2013, an eight-year review was published about implementation of a comprehensive tobacco dependence education curriculum at the Medi School of Dental Hygiene in Switzerland. They concluded even though the application of the smoking theory in clinical practice was successfully implemented, it may still be improved to better identify smokers and increase follow-up interventions in order to increase quit rates.[12] Around this time, unfortunately, there are some reports that implies the prevalence of smoking among health professionals may be high.[13]

A review published in 2016 about the effectiveness of the intervention of dentists in smoking cessation confirms that the role of dental professionals in the prevention of smoking and encouraging patients to quit had not been taken into account until the last 15-20 years; however, several countries have developed ways to incorporate interventions against smoking in routine dental check-ups.[14] In general, there are some interventions that dentists have performed in dental settings, adopting guidelines such as the 5As (Ask, Advise, Assess, Assist, Arrange). Now professionals taking into account the level of addiction recommend a therapy that includes, as mentioned before, treatments such as behavioral intervention/nicotine replacement therapy/pharmacological therapy.

In 2019, an investigation carried out in Spain in dental students, concluded that a positive motivation to implement smoking cessation strategies (TUC) demonstrates the need to modify university curricula,[15] a conclusion that was obtained some years before. Currently, the research in this topic identifies the main barrier is training to address and improve the engagement of dental professionals in patients' smoking cessation . The evidence showed that lack of time and remuneration were negatively associated with providing TUC counselling.[16] Furthermore, a claim that has been permanently reported during all these years regarding the intervention of tobacco consumption, is that not enough training had been received on this subject and for this reason we do not have so much confidence in advising a smoker or consumer of alternative products of the tobacco.

Despite extensive evidence on the effects of smoking not only on general health but also on oral health, the smoking cessation rate is not promising. The dental team may play an important role in promoting this, because of the evidence of efficacy for smoking cessation in dental patients. However, using the tools of D&I science may help investigators to design TUC programs based on the scientific evidence and that include the following steps

1) identifying and characterizing the implementation setting,

2) identifying and engaging key stakeholders across multiple levels within the implementation setting,

3) characterizing barriers and facilitators to implementation, and

4) problem-solving to address potential barriers.[17] Some new multi-disciplinary approaches should be included such as those related to precision medicine (genetic and smoking),[18] other biochemical evaluations (collecting saliva samples for cotinine analysis)[19] or psychotherapy (cognitive behavioral therapy).[20] According to the training, it is imperative to add specific education on respiratory diseases, especially the effects of smoking on the severity of COVID-19.

A mandatory approach to be introduced and implemented for the dental team involved in smoking cessation activities.

REFERENCES.

1. Parascandola M. Tobacco harm reduction and the evolution of nicotine dependence. Am J Public Health. 2011;101(4):632-41.

2. Meo SA, Al Asiri SA. Effects of electronic cigarette smoking on human health. Eur Rev Med Pharmacol Sci. 2014;18(21):3315-9.

3. Liu W, Tao ZW, Wang L, Yuan ML, Liu K, Zhou L, Wei S, Deng Y, Liu J, Liu HG, Yang M, Hu Y. Analysis of factors associated with disease outcomes in hospitalized patients with 2019 novel coronavirus disease. Chin Med J (Engl). 2020;133(9):1032-8.

4. Brake SJ, Barnsley K, Lu W, McAlinden KD, Eapen MS, Sohal SS. Smoking Upregulates Angiotensin-Converting Enzyme-2 Receptor: A Potential Adhesion Site for Novel Coronavirus SARS-CoV-2 (Covid-19). J Clin Med. 2020;9(3). pii: E841.

5. Calfee CS, Matthay MA, Kangelaris KN, Siew ED, Janz DR, Bernard GR, May AK, Jacob P, Havel C, Benowitz NL. Cigarette Smoke Exposure and the Acute Respiratory Distress Syndrome. Crit Care Med. 2015;43(9):1790–7.

6. Matthay MA, Zemans RL. The acute respiratory distress syndrome: pathogenesis and treatment. Annu Rev Pathol. 2011;6:147–63.

7. Matthay MA, Aldrich JM, Gotts JE. 2020. Treatment for severe acute respiratory distress syndrome from COVID-19. Lancet Respir Med. 2020;8(5):433-4.

8. Lomas J. Diffusion, dissemination, and implementation: who should do what? Ann N Y Acad Sci 1993;703:226–35, discussion 235–7.

9. Warnakulasuriya S. Effectiveness of tobacco counseling in the dental office. J Dent Educ. 2002;66(9):1079-87.

4. Brothwell DJ, Gelskey SC. Tobacco use cessation services provided by dentists and dental hygienists in Manitoba: part 1. Influence of practitioner demographics and psychosocial factors. J Can Dent Assoc. 2008;74(10):905.

11. Morgan SK, Dumire W, Caudill C, Lewis A. Tracking dental patient tobacco use and intervention in the academic clinical setting. J Dent Educ. 2012;76(11):1448-56.

12. Ramseier CA, Burri M, Berres F, Davis JM. The implementation of a tobacco dependence education curriculum in a Swiss Dental Hygiene School - an 8-year review. Int J Dent Hyg. 2013;11(2):142-50.

13. Giorgi E, Marani A, Salvati O, Mangiaracina G, Prestigiacomo C, Osborn JF, Cattaruzza MS. Towards a smoke-free hospital: how the smoking status of health professionals influences their knowledge, attitude and clinical activity. Results from a hospital in central Italy. Ann Ig. 2015;27(2):447-59.

14. Effectiveness of dentist's intervention in smoking cessation: A review. Omaña-Cepeda C, Jané-Salas E, Estrugo-Devesa A, Chimenos-Küstner E, López-López J. J Clin Exp Dent. 2016;8(1):e78-83.

15. Lorenzo-Pouso AI, Pérez-Sayáns M, Pérez-López D, Otero-Rey EM, García-García A, Blanco-Carrión A. Knowledge About the Relation Between Tobacco and Disease and the Attitude Toward Advising the Cessation of Its Consumption Among a Group of Spanish Dental Students. J Cancer Educ. 2019;34(1):145-3.

16. Chaffee BW, Urata J, Couch ET, Silverstein S. Dental Professionals' Engagement in Tobacco, Electronic Cigarette, and Cannabis Patient Counseling. JDR Clin Trans Res. 2020;5(2):133-45.

17. Koorts H, Eakin E, Estabrooks P, Timperio A, Salmon J, Bauman A. Implementation and scale up of population physical activity interventions for clinical and community settings: the PRACTIS guide. Int J Behav Nutr Phys Act 2018; 15(1):51.

18. Loukola A, Hällfors J, Korhonen T, Kaprio J. Genetics and smoking. Curr Addict Rep. 2014;1(1):75-82.

19. Stoops WW, Johnson MF, Strickland JC, Knudsen HK, Gilbert GH, Massingale SD, Ray MN, Studts CR, Atchley L, Reynolds G, Slade E, Studts JL. Feasibility of Collecting Saliva for Biological Verification of Tobacco Use Status in Dental Practices and Patients' Homes: Results from the National Dental PBRN. Community Dent Health. 2019;36(3):187-9.

20. Goyal J, Menon I, Goyal T, Passi D, Gupta U, Gupta R. Effectiveness of cognitive behavioral therapy and basic health education for tobacco cessation among adult tobacco users attending a private tobacco cessation center. J Family Med Prim Care. 2020;9(2):830-3.