



## Survey of Santiago Chile Dentists Regarding the Use of CAD/CAM Technology in Private Care Networks Clinics (2018)

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### Abstract

**Introduction:** The use of digital CAD/CAM technology is relatively new. There are no previous studies in Chile regarding the use of this technology by dentists.

**Purpose:** The purpose of this Survey was to identify the use of CAD/CAM digital rehabilitation systems at Dental Office care networks of the Metropolitan Region of Santiago de Chile in 2018 and investigate the relationship of demographic factors with the use or non-use of digital CAD/CAM technology.

**Materials and Methods:** A survey was applied to 70 professionals corresponding to three dental centers, Norden, BYO and Cumbre, which are distributed in 18 clinics in the Metropolitan Region of Santiago. Its goal was to reveal information regarding age, sex, commune, years that have been exerting the profession, knowledge and attitudes about the CAD/CAM system, source of training, digital system used and perception of technology in the future.

**Results:** The number of surveys completed was seventy. Most respondents reported knowing what CAD/CAM is. The age of the professionals who responded was between eighteen and forty years, mostly female. Most of them use some aspect of this system in their work and they have been exercising from 0 up to teen years. They work mostly in the eastern sector.

**Conclusion:** The majority of respondents (98.6%) consider that CAD/CAM will have a preponderant role in the future. they have been exercising from 0 up to teen years. They work mostly in the eastern sector.

**Keywords:** CAD/CAM Technology; Private Care Networks Clinics; Age; Sex; Commune

### Introduction

Nowadays the use of digital systems for the elaboration of indirect restorations is the latest technology, especially considering the multiple advantages they offer us, including comfort, aesthetics, material resistance and, above all, saving time in the chair, a fundamental factor for the patient [1-17].

National reality indicates that there are few professionals trained in the use of these technologies, which could be due to the high initial investment, the quality and survival of the materials used for the restorations and, finally, the expiration of this technology, leaving the investment made obsolete to the professional, which creates uncertainty about investing in these technologies or not, both academically and at the market level.

### Purpose of the Study

The purpose of this study is to recognize the use of digital technology CAD/CAM in private dental care networks of Santiago, Chile in 2018.

### Materials and Methods

Permission was requested from the directors of the clinical centers by a letter requesting authorization to apply the survey. Regarding the instrument, a brief survey of 19 questions was applied (Box 1). Its main objective is to provide information regarding sociodemographic factors and the use of CAD/CAM for subsequent statistical analysis. Most of the questions were multiple choice, and only one question was open. This was based on the adaptation of

**Part 1- Filiation data**

This survey is anonymous, please indicate your Age

- 18 to 40 (75,7%)
- 40 or more (24,3%)

**Part 2- Knowledge and Attitudes Data on CAD / CAM System**

Do you know what CAD/CAM is?

- Yes (98,6%)
- No (1,4%)

Do you know what CAD (Computer aided design) means?

- Yes (97,1%)
- No (2,9%)

Do you know what CAM (Computer aided manufacturing) means?

- Yes (95,7%)
- No (4,3%)

**Section 1- Demographics**

Gender

- Female (58,6%)
- Male (41,4%)

How many years have you been qualified as a dentist?

- 0-10 years (57%)
- 11-20 years (23%)
- More than 20 years (20%)

How much formal training have you had?

- GDR (21,1%)
- Specialist in prosthodontics (5,6%)
- Dentist with other post-graduate in prosthodontics or restorative dentistry (36,6%)
- Other (36,6%)

Do you use any aspect of CAM/CAM in your workflow?

- Yes (58,6%)
- No (32,9%)
- Have used it the past but no longer use currently (8,6%)

Geographic location where the use of CAD / CAM technology is performed (Indicate the specific commune of the metropolitan region)

- Northern sector (1,6%)
- Southern sector (6,4%)
- Eastern sector (64,5%)
- Central sector (27,4%)

**Section 2: Questions for CAD/CAM users**

How long have you been using CAD/CAM for?

- 0-5 years (38,6%)
- 6-10 years (42,9%)
- 11-15 years (17,1%)
- >15 years (1,4%)

What precipitated your move towards a CAD/CAM workflow? (Please tick all that apply)

- To reduce lab fees (22,7%)
- To improve quality (56,8%)
- To improve productivity (61,4%)
- To use new dental materials which can only be fabricated with CAD/CAM, e.g. zirconia
- To keep up with technology (38,6%)
- To improve communication with laboratory
- As a marketing tool for patients (59,1%)
- Other (Please specify)

Which of these aspirations do you think you have achieved with CAD/CAM? (Please tick all that apply)

- Reduction in bills (13,6%)
- Improvement in quality (56,8%)
- Improvement in productivity (65,9%)
- It has been a good marketing tool for patients (59,1%)
- Kept up with technology in dentistry (70,5%)
- Improvement in communication with the laboratory (15,9%)
- Other (Please specify) (9,1%)

Which aspects of the digital workflow do you use (please tick all that apply)?

- Chairside CAD/CAM for example, CEREC (69,8%)
- Intra-oral digital impression (74,4%)
- Laboratory scanning of impressions or casts (30,2%)
- Computer aided design (CAD by laboratory or specialist milling centre (58,1%)
- Computer aided manufacturing (CAM by laboratory or specialist milling centre) (60,5%)
- Other (Please Specify) (2,3%)

Where did you undertake your CAD/CAD system training (Please tick all that apply)?

- Companies providing CAD/CAM system (27,3%)
- Private courses (50%)
- Self-taught or taught by other user etc (43,2%)
- Other (Please specify) (1,4%)

Did you feel your CAD/CAM training was sufficient?

- Yes
- No

Did you feel your CAD/CAM training was sufficient?

Yes (37,1%)

No (42,9%)

Do you feel that the availability of CAD/CAM has affected your clinical decision-making?

Yes (37,1%)

No (25,7%)

Has CAD/CAM led to changes in your use of dental materials?

No (15,7%)

Yes (please comment) (47,1%)

What digital system do you use?

CEREC (79,5%)

PROCERA (11,4%)

LAVA (0%)

EVEREST (2,3%)

Other (25%)

What are the least satisfactory aspects of your CAD/CAM finished restorations?

Marginal fit (11,4%)

Contact points (13,6%)

Occlusion (15,9%)

Aesthetics (47,7%)

I do not see that these restorations have a weakness (29,5%)

Other (Please specify) (15,9%)

**Section 3: Questions for non-users of CAD/CAM**

Why do you not use CAD/CAM? (Please tick all that apply)

High costs (21,7%)

Inferior quality of restorations

I am not very technologically aware

Do not see that there are any advantages over conventional techniques

Other (Please specify) (78%)

Why did you stop using CAD/CAM (past-users)? (Please tick all that apply)

Higher costs (40%)

Inferiority quality of restorations

Could not learn how to use the system (20%)

Did not see that there are any advantages over conventional techniques (0%)

Other (Please specify) (60%)

Would you be interested in incorporating CAD/CAM as part of your workflow?

Yes (78,3%)

No (21,7%)

**Section 4 – General questions for all dentists in survey**

Do you think that CAD/CAM has big role in the future of dentistry?

Yes (98,6%)

No (1,4%)

**Box 1:** Survey questions (with responses results).

the questionnaire generated by TRAN D, NESBIT M, PETRIDIS H for the “Survey of UK dentists regarding the use of CAD/CAM technology” study consisting of 19 questions in relation to 4 variables (Use of the CAD/CAM System, Demographic location, Questions for non-CAD/CAM users, Questions for CAD/CAM users and finally general questions for dental surgeons) [18]. The creators of the instrument were asked about the possibility of its use, which they

agreed. After the acceptance of the study by the directors, 22 private dental care centers of the metropolitan region were visited: NORDEN, BYO, CUMBRE clinics, informed consent was given (in annexes) and after this, if the dentist surgeon decided to participate voluntarily and consciously, the instrument was applied, which consists of a self-reported survey.

The answers were collected through Microsoft Excel spreadsheets. Statistical analysis via chi-squared testing was used to examine potential associations between the survey responses carried out (NHS or private). A significance level of 2.5% was used rather than a conventional 5% level to reduce the potential acts of multiple testing. Any P-values less than 0.025 were therefore regarded as statistically significant throughout the analyses.

## Results

Following the exclusion of duplicates and invalid addresses, the survey was successfully distributed to 298 dentists, who completed 70 surveys, which resulted in a response rate of 23.4%. In relation to the item "Knowledge Data and Attitudes on CAD/CAM System" 98.6% indicated to know what CAD/CAM is. In relation to the specific knowledge of the areas of the system, on one hand, regarding what CAD (Computer aided design) is, 97% indicated to know what it was. On the other hand, regarding CAM (Computer aided Manufacturing/Computer Aided Manufacturing), 95.7% said they knew what it was. In relation to the Demographic Questions item, the age of the professionals who answered was 75.7% between the ages of 18 and 40, and 24.3% between the ages of 40 and over. Regarding sex, 58.6% of respondents were female (41 participants) and 41.4% were male. Concerning the question "Do you use any aspect of the CAD/CAM System in your work?" 58.6% indicated that they currently use it (41 participants), 8.6% (6 participants) indicated that they use it sometimes, but not currently, and 32.9% (23 participants) have not used it. Finally, in the question "since when they have been practicing as dental surgeons", 57% indicated doing it 0 to 10 years ago, 23% 11 to 20 years ago, finally, 20% have been practicing for more than 20 years. In relation to the formal training that participants have received, 36.6% are dentists with postgraduate dentistry and restorative dentistry and 36.6% answered "others", finally, the third preference is Surgeons Dentists without specialty with 21.1% of a total of 71 cases reported. Regarding the geographical location in which CAD/CAM technology is used, 64.5% answered that they work in the eastern sector, 27.4 in the central sector, 6.4 in the southern sector, finally, in the northern sector, is the 1.6%. Regarding the questions for the 70 CAD/CAM users (which are those who previously indicated that they use or used the system and answered in section number 2) they selected the time they have been using the system mainly. There is a 42.9% located between 6 and 10 years of use, 38.6% between 0 and 5 years, 17.1% between 11 and 15 years and pro-

fessionals who used it for more than 15 years are 1.4%. Regarding whether the training was sufficient, 37.1% indicated that it was sufficient, while of the total respondents, 42.9% indicated that it was not sufficient. Regarding whether the availability of CAD/CAM affects clinical decision-making, 37.1% of the total surveys indicated that it does affect them, the other 25.7% of the total sample indicated that their clinical decision was not affected. In relation to the change of dental materials due to the use of CAD/CAM, 47.1% indicated that the use of dental materials has changed. In relation to the reasons for using the CAD/CAM system, out of a total of 138 cases reported, the 3 main preferences were: "To keep up with dental technology" with 38.6%, "To improve productivity" with 61.4% finally "To improve the quality" with 56.8%. Regarding the aspirations that the professional believes he has achieved with CAD/CAM, of a total of reported cases (146 responses) the 3 main preferences were an "Improvement in productivity" with 65.9%, then an "Improvement in quality" with 56.8%, finally "It has been a good marketing tool for patients" with 59.1%. As for the question, what aspects of digital work do you use? Out of a total of reported cases (127 responses), the 4 main preferences were: "Intraoral digital printing" with 74.4%, in relation to "Assistance of the CAD/CAM system in the clinic, e.g. CEREC" was 69.8%.

## Discussion

In relation to where the professionals in CAD/CAM systems were trained, a total of reported cases (58 responses) indicated, in order of their 3 preferences: 50% did it in private courses, 43.2% self-taught or taught by another user, etc. 27.3% Companies that use the CAD/CAM system, and another 11.4% that indicated in written responses (undergraduate and clinical training). Regarding what digital system dentists use private care networks in Santiago in 2018, it was indicated that out of a total of reported cases of (52 responses) 79.5% indicated using CEREC, 25% indicated using another, 11.4% indicated using Procera and Everest 2.3% of the preferences. Finally, regarding professionals who use the CAD/CAM system, what are the least satisfactory aspects of their CAD/CAM finished restorations? with a total of reported cases (59 responses that marked that they applied) the 4 main preferences were "Aesthetic" with 47.7%, a 29.5 indicated that "I did not see that these restorations have a weakness" and 15.9% indicated by occlusion and other factors. In relation to section number 3: "Questions for NO CAD/CAM users" of the sample taken from 70 dentists in Santiago's private care networks in 2018, of the 23 participants who

answered this section in relation to the question "Why don't you use CAD/CAM?" 78% indicated "for other reasons", 21.7% indicated the "high costs". Regarding the question, why did you stop using CAD/CAM? (past users) of a total of reported cases of (6 responses) indicated with 60% "for other reasons", 40% considered that there were "higher costs" and finally with 20% "could not learn to use the system". Finally, for non-users of CAD/CAM if they would be interested in incorporating CAD/CAM as part of their work out of a total of 23 participants in this question, 78.3% answered that yes, they would be interested and 21.7 would not be interested. Regarding the belief about whether CAD/CAM has an important role in the future of dentistry, 98.6% said they did, and 1.4% did not believe it.

### Survey design and methodology

When a delivery method is used personally by giving informed and subsequent consent if the dentist decides to participate voluntarily and consciously, the instrument was applied, which consists of a self-reported survey. This delivery method generated low participation rates that may be due to the analysis of the instrument itself, due to the following characteristics: the length of the instrument that hindered its response, the lack of understanding of the instrument and finally in relation to what the instrument requested that evidenced ignorance from the professional in matters of technological update such as CAD/CAM technology. On the other hand, the use of the online survey application could have increase the sample because it is easier to answer at non clinical times.

On the other hand, the factor that of the total of 23 brands that were established as a universe (with a total 322 private care network) through the information obtained by the private care networks website included in the study, when compared with the real information is decreased due to the absence of clinics (size of the universe was reduced to 298), so finally 70 participants were obtained, because the bases were not as precise as expected. This makes a 23% participation, in relation to the response rate of the original study through private online databases that was 19% [18].

### Demographics

The response rate was higher in the eastern sector of Santiago, which could be an initial bias of the participating centers that were mainly grouped in these communes where their response rate was significantly higher in conjunction with Santiago centro. There-

fore, a new application with more centers and a more homogeneous universe between communes would be necessary. It should also be considered that many of the professionals who answered worked in different centers of the same company, so the sample was reduced.

### Responses from CAD/CAM users

More than half of the respondents used CAD/CAM technology as part of their work and in this regard the professionals who responded have been using the system between 0 and 10 years, this result highlights the fact that CAD/CAM is still a relatively new development in the dental world for most of the dentists. The lack of similar studies in Chile and Latin America does not allow significant comparisons of the results of the current study with the existing literature. On the other hand, some professionals used it to apply it in teaching and education. Among the comments "other" on the disadvantages, the impossibility of glazing when there is no furnace is mentioned, and the lack of capacity of the machine to capture juxtagingival and intracrevicular preparations.

### Responses from non-CAD/CAM users

The majority of respondents in the survey did not currently use CAD/CAM in their work. The most common reason for not using CAD/CAM was the high initial costs, however, more than half of the non-users responded positively regarding the future incorporation of digital workflows, particularly younger dentists, as would be expected. The various interesting comments made by respondents clearly highlighted that the initial costs are the main obstacle to the incorporation of digital workflows, the vast majority of respondents (98%) considered that CAD/CAM had a great future in dentistry. Dentists who performed predominantly private work were much more likely to respond positively. Besides, the importance of carrying out future studies in the field of CAD/CAM education in undergraduate is highlighted, because today in Chile, most of the courses that are practiced are private, and the need for training in this area is perceived.

### Future of CAD/CAM in dentistry

Regarding the national reality, in an interview with the current commercial manager of Siromax (Distributor of the CAD/CAM system in South America) Mr. German Kociuk to date only one university has ventured to take this program to the classroom undergraduate dentistry (Universidad de los Andes), this being a progressive

training process in their academic training throughout the 6 years of the career.

The results in the university have been very positive, the students take advantage of this enriching experience since they also have a software called prep check, which allows them to correct their preparations, making a 3D digital analysis of them according to certain parameters, which makes the correction process more transparent and expeditious.

Within another remarkable feature of this process is the fact that patients can internalize with all the treatment they are doing since they can see it through the screens.

What is under discussion in a large part of the universities is whether this issue should be addressed in pre-or post-graduate schools [7,19].

## Conclusion

Within the limits of this study, the following conclusions could be drawn:

- The use of CAD/CAM in private care networks in the Chile Metropolitan Region, are mainly in the Highest income sector (eastern sector), by female professionals who have used the system for 0 to 10 years. The majority of respondents who use CAD/CAM technology in their workflow expressed that the reasons for its use are focused on higher quality, higher productivity and mainly to keep up with dental technology.
- As for the aspirations that the professional believes he has achieved with CAD/CAM, an improvement in productivity, an improvement in quality and being a good marketing tool for patients.
- In relation to the aspects of CAD/CAM digital work that are mainly used are intraoral digital printing, assistance of the CAD/CAM system in clinic, computer-aided manufacturing (CAM by laboratory or specialized milling center) and finally the use of computer-aided design (laboratory CAD or specialized milling center).
- Regarding where the professionals did their training in CAD/CAM systems, they indicated the following order of preferences: half did it in private courses, then self-taught or taught by another user, etc. and finally by companies that provide the CAD/CAM system.

- The vast majority of dentists agree that CAD/CAM will have preponderant a role in the future of dentistry
- A significant number of CAD/CAM users felt that their training was sufficient.

## In brief:

1. It reports the results of the first study carried out in Chile regarding the use of the CAD/CAM system.
2. It indicates that the majority of people who answered the survey use CAD/CAM technology in their work.
3. Suggests that dentists agree that CAD/CAM will have a preponderant role in the future of dentistry.

## Declaration of Interests

Authors declare that they have no conflict of interest with respect to the submitted work.

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