Revista de Estilos de Aprendizaje / Journal of Learning Styles
ISSN: 1988-8996 / ISSN: 2332-8533

Methodologies and innovation in classroom instruction in the subject integrated dental clinic. Tools to evaluate students' satisfaction and their involvement in quality assessment processes

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Recibido: 5 de diciembre de 2021 / Aceptado: 10 de marzo de 2022

Abstract

The present study is created from the need, justified in other studies, to improve the dental clinical care, the quality of the subject in fifth year of Dentisty degree, Integrated Dental Clinic. This project main objective is to establish and evaluate innovative teaching methodologies that are being implemented in the subject Integrated Dental Clinic to improve the quality of care for children. We developed several Checklists, which are protocoled for every clinical treatment and were made and agreed by 2 experts in pediatric dentistry field. Each one of the checklists stated every single action, so the students could avoid non-optimal interventions for the patient. An intragroup test of 50 patients was performed. Regarding the impact calculated of the measures carried out on 50 patients/students, the results make us believe that checklists, allows students and clinicians to important problems in relation to the allocation of patients. With this research, we have tried to design a learning system that we hope will develop the quality control in the

dental treatments in the subject Integrated Dental Clinic, not only for the students but for the teachers also. Students will be able to evaluate their procedures, and this will make the teacher's confirmation of the quality of the clinical assistance performed.
Keywords: Checklists; quality control; teaching methodologies.

[en] Metodologías e innovación en la instrucción presencial en la asignatura clínica dental integrada. Herramientas para evaluar la satisfacción del alumnado y su implicación en los procesos de evaluación de la calidad

Resumen
El presente proyecto surge de la necesidad, constatada en estudios anteriores, de mejorar la atención clínica, la visibilidad y la calidad de la asignatura Clínica Odontológica Integrada, que cursan los alumnos del último curso de la Licenciatura en Odontología. Esta investigación tiene como objetivo establecer y evaluar metodologías de enseñanza innovadoras con el fin de mejorar la calidad de atención a los niños en la asignatura Clínica Odontológica Integrada. Creamos varias listas de comprobación (Checklists) que están protocolizadas para cada procedimiento clínico, previo consenso de 2 expertos en odontología pediátrica Cada una indica cada una de las acciones para evitar intervenciones no óptimas para el paciente. Se realizó una prueba intragrupo con una muestra de 50 pacientes. En cuanto a la cuantificación del impacto de las medidas realizadas en 50 pacientes/estudiantes, los resultados nos llevan a pensar que el uso de listas de verificación permite a los estudiantes evitar problemas importantes en relación con la asignación de pacientes. Con este Proyecto hemos diseñado un sistema de aprendizaje que esperamos sirva para desarrollar el control de calidad en la clínica dental. Los estudiantes podrán evaluar sus propios procedimientos y esto generará la confirmación por parte del docente de la calidad de la asistencia clínica realizada.
Palabras clave: Checklist; control de calidad; metodologías de enseñanza.

1. Introduction

Procedural checklists are routinely used as quality measures in most of industries, more often in those with high-risk such as nuclear energy ore aviation and have successfully reduced the risks associated with all the procedures. (Hales & Pronovost, 2006) It has been suggested that checklist have the simplicity to allow rapid and effective implementation without significant cost along with more improvements. (Semel et al., 2010)

For many years now, surgeons and other clinical practitioners have adopted checklists in order to lower the rates of complication and death related to surgical procedures. Haynes et al. (Haynes et al., 2009) showed that surgical checklists could be implemented with success in a diverse group of hospitals, with concomitant reduction of morbidity and mortality. Other authors tried to reduce medical morbid, and it has been successfully achieved using checklists. (Avansino et al., 2011) Since the WHO developed the surgical safety checklist (Sleiman et al., 2019) there has been many authors that had shown the improvement of the surgical treatments with this tool. Panesar et al. asked for the development of tools like the checklist to assist in the implementation of patient safety incidents (PSI). A transversal study with use of the National Patient Safety Agency Database stayed that more than 20% of PSIs may have been prevented in cases thanks to safety surgical checklist. (Panesar et al., 2011). One example of checklist development was its use in intensive care units across Michigan (more than 100), which reduced central line–associated bloodstream infections and mantained the reduced infections over time (Berenholtz et al., 2004;

Papaconstantinou et al., 2013; Pronovost et al., 2010). These numbers and studies, and many more, are likely responsible for its widespread and early adoption. (Haynes et al., 2009; Papaconstantinou et al., 2013; Wilson & Walker, 2009).

However, it has become clearer that barriers to developing the checklist and their implementation exist and may affect the use and accuracy of checklist. (Fourcade et al., 2012) Barriers to checklist development have many factors, including cultural and structural ones. Most studies have shown that perceptions of patient safety and patient care are high, but in the other hand, there is a negative perception on the effect of the surgical checklists on efficiency even though there is plenty of data that suggest the opposite. (Fourcade et al., 2012; Papaconstantinou et al., 2013; Wilson & Walker, 2009)

The basic objective of "patient safety at dentistry" is to avoid as far as possible the avoidable adverse or iatrogenic events (accidents, errors or complications) associated to healthcare, in this case, dentistry(Perea Pérez, 2011).

Among the initial recommendations for patient safety, Perea (Perea Pérez, 2011)includes the need to take basic precautions in the most potentially dangerous processes, where the use of check lists stands out. Practical dental teaching, based on the actual treatment of patients by the students, is essential. However, it is very common for students to face patients who have been treated by other partners and they see the patient for the first time when the treatment has been already started and they have to continue it. In the same way, it is also very frequent that the students do not remember the patients or do not relate the patients and the treatment that is being performed. According to Iglesias(Iglesias-Linares et al., s. f.), clinical decision making in this sense occurs under a cognitive activity extremely vulnerable to error. Among the solutions that have been proposed to solve the problems arising from the imperfections and failures of this intuitive system, reflexive practices and metacognitive training stand out. In this sense, checklists could be a valid alternative to improve diagnostic reasoning and help knowledge by reducing cognitive errors in dentistry (Iglesias-Linares et al., s. f.)

In the educational dentistry field according to Acosta,(Acosta-Gío, 2015) stomatology training institutions offer favourable conditions to learn about patient´s safety challenges in dental environment. Systems should be established for reporting, documentation, and analysis of weaknesses. In this way, both professors and students will be able to identify risks in clinical practice and may issue recommendations to make dental procedures highly safe (Christman et al., 2014). New curricula for teaching evidence-based dentistry could help to integrate clinical guidelines and emphasize patient safety. A collection of adverse events, explained as case studies, will allow the campus community to learn from the mistakes made and to make improvements for Patient Safety.(Brennan et al., 1991; Perea-Pérez et al., 2011).

The present study is created from the need, justified in other studies, to improve the dental clinical care, the quality of the subject in fifth year of Dentisty degree, Integrated Dental Clinic The need for improving the specific care to paediatric patients makes us to propose for a logic, and orderly preparation of the dental care.

2. Objectives

a. Principal aim

The present project proposes the establishment of innovative teaching methodologies to improve the quality of care for children. The student takes a fundamental part in this project since he will carry out the quality control of the clinical procedures carried out in the Integrated Dental Clinic subject.

b. Specific aims

2.2.1 To evaluate the weaknesses in the subject of dental care in the Integrated Dental Clinic in the following areas:

a) Before entering the dental office.
b) During dental procedures.
c) At the end of dental treatment.

2.2.2 Develop specific "check list" documents to improve the quality of care at each point.
2.2.3 Develop post-intervention documents and training material to increase the motivation of patients and their families towards dental treatment.

3. Methodology

This paper developed the results of the PMICD nº 95, carried out during one academic course with the students of the subject Integrated Dental Clinic. The methodology that had been developed is shown in the following bullet points and how it has been made:

3.1. Implementation of measures on the teachers (elaboration and start-up of measures):

- Gathering the teachers involved in the project, with two experts in the field, through detailed meetings in relation to the proposed objectives and the specific degree of involvement of each member.
- Development of didactic-practical innovation units on quality control interventions, and critical analysis of the methodology traditionally used for the dental assistance of children in the Integrated Dental Clinic of the Dentistry Faculty.

All this, allow us for the elaboration of a global document "checklist", and in the last part of the elaboration agreed by two experts, which contemplates the revision of basic information on each patient, and the revision of materials, common to the different procedures and specific to each treatment.

Informative checklists were produced and provided for the patients after performing the different procedures: this would help the students in transmitting the postoperative recommendations and would facilitate the patient's follow-up.

- In-group pilot test in relation to the effectiveness, coverage of objectives and suitability of the innovation material developed.

3.2. Measures implementation about the student:

- Projection and deliberation of didactic-practical units developed and validated: Informative sessions were held with the students to convey the objectives that are pursued with the completion of the checklists and were given precise instructions for completing them.

3.3. Evaluation of the measures:

- Compilation of the evaluation data by the teachers on the measures taken (Checklist): A total of 50 procedures were performed using checklists, including reviews, odontopediatric and orthodontic diagnostic procedures, preventive actions, and conservative and surgical treatments. Different actions had to be verified before, during and at the end of each procedure, according to the facilitated checklist. A teacher, a member of the research team, supervised the activities at the different times in which the student had to complete each checklist. At this point, the teacher only took note of the errors and problems that were most freque

- ntly raised, trying not to influence the students' actions in this regard, to avoid bias in the evaluation. Subsequently, a descriptive analysis of these errors and more frequent problems were performed.

- Compilation of data of evaluation of the measures applied in the students: At a later stage, a survey was passed to students who had been using checklists in their clinical procedures in order to know their opinion regarding their usefulness and what had been the difficulties they had encountered in completing them. In the same way as in the previous case, a descriptive analysis of the answers given in these surveys was carried out.

3.4. Statistical methodology:

The variables that we studied in the research were:

.- The items on the checklist of the students and the teachers.

.- The items on the survey of the students.

Those checklist items were filled as yes or no for the students and for the teachers in the moment the students were performing a dental treatment.

The students filled the questions on the survey after the course ended. First, we made a descriptive analysis on the items of the checklist and the question on the survey, with percentages and mean deviations on the items and answers.

In order to compare the student´s and the teacher´s checklist we made a Kappa concordance on the items of the check list. With the results of the concordance, we distributed the results as:

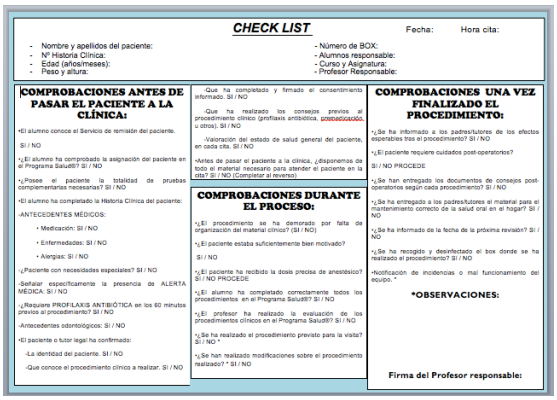
- Low concordance: when the item had a value of 0.4 or lower
- Medium or moderate concordance: when the item had a value between 0,41 and 0,60.
- Substantial or almost perfect concordance: Values above 0,61.

4. Results

a. Elaboration and implementation of the measures

Following the methodology described, didactic materials were developed (in form of checklists), in order to satisfy different needs of the integrated dental clinic for children. (Figures 1 and 2): a comprehensive checklist of clinical procedures was elaborated. It includes information about the clinical and administrative procedures of the centre, of obligatory compliance, about the patient and about the different materials that might be necessary in each procedure.

Specific checklists were also developed to explain and deliver patients at the end of their appointments, including instructions for maintenance and care of removable device or instructions to follow after extraction, filling or prophylaxis and application of fluoride. The creation of these materials has meant an innovation in educational resources in open and virtual teaching available to the students of the last two years of the Degree in Dentistry. The totality of the documentation generated in this study was attached in the Virtual Campus of the subject, so that it could be available at all times for the student and teaching staff and was retained for later courses.



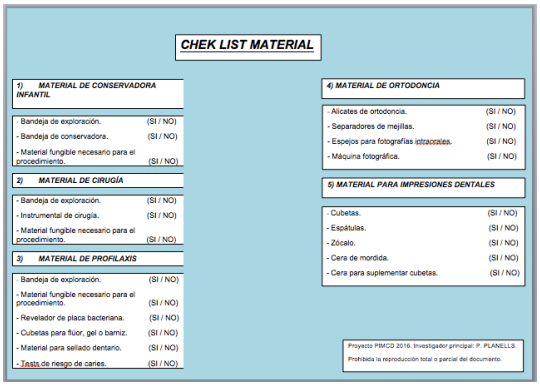


Figure 1: clinical procedures global check-list

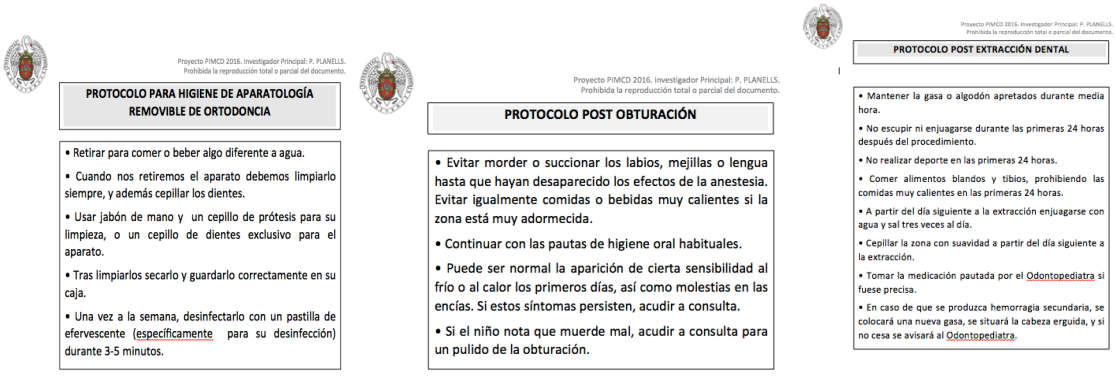


Figure 2: Other examples of materials developed for students

b. Evaluation on the use of checklists by the teacher

On the one hand, 50 of the checklists completed by the students were collected, and on the other, a parallel checklist for each of the 50 previous checklists, where the evaluating teacher objectively noted the performance of the students with respect to each of the items. From the results obtained comparing both exercises, we highlight the following:

One of the most striking facts that we could find was that, in a high percentage of cases (up to 42%), the students did not fill the checklist at the right time, doing everything at the end of the procedure, up to a 14 % of the chances or even everything at the beginning, in 28% of cases), which indicates that the checklist is not being used correctly.

We were able to find repeated doubts as to how to respond to some of the items raised. Especially those items referring to the verification of medical data of the patient were inadequately interpreted by 16% of the students: in these items the student is expected to check for allergies, use of medications, need for antibiotic prophylaxis, etc. In these 16% of the students answered "yes" or "no" to these questions, instead of answering whether they had reviewed it.

Some items, although clearly defined, were not filled by all the students, highlighting the item in relation to the child's weight and height, which was not filled in 28% of the occasions. Discarding the items that raised the most doubts and those that could not be verified correctly, the index of agreement between the answers provided by the students and the answers provided by the observer teacher was calculated, eliminating from the calculation the students who did not answer. Some lower values of the Kappa index indicate that the student did not always respond with the sincerity that is required, losing the positive effect of the check list on those occasions.

i. Checks before passing the patient to the clinic

We obtained values lower than 0.4 (insignificant or discreet agreement) in the following items:

- Has the student checked the assignment of the patient in the Health Program?
- Before going to the clinic, do we have all the necessary material to attend the patient in the appointment?

We obtained moderate values (between 0.41 and 0.60) in the following items:

- Does the patient have all the necessary complementary tests?

In the rest of the items, the correlation of responses was substantial or almost perfect (values greater than 0.61).

ii. Checks during the process

In the evaluation of the items corresponding to this phase, we did not obtain values lower than 0.4 (insignificant or discrete agreement).

Only in the item "The procedure has been delayed due to lack of organization of the clinical material?" We obtained moderate values of 0.60.

In the rest of the items, the correlation of responses was substantial or almost perfect (values greater than 0.61).

iii. Checks after the procedure is completed

In all items evaluated in this phase, the correlation of responses was substantial or almost perfect (values greater than 0.61).

c. Assessment of the student's use of check-lists

In this last phase, a pilot study was carried out on 17 surveys that were passed to students who, voluntarily, wanted to complete them. This would allow us to know the student's point of view regarding the use of check lists. These were the results: 100% of the students responded affirmatively to the question "Have you understood the purpose of the checklists?".

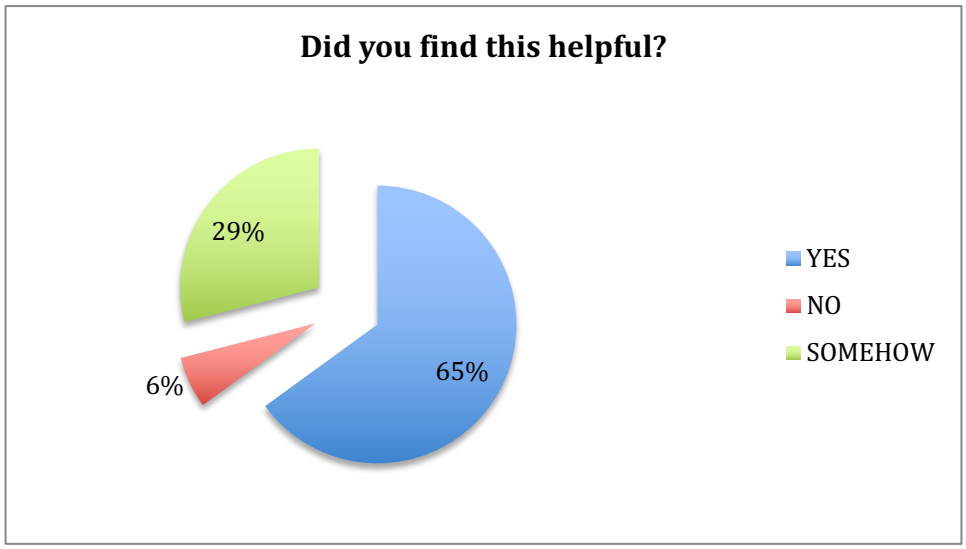


Figure 3: Answers to item "Did you find this helpful?"

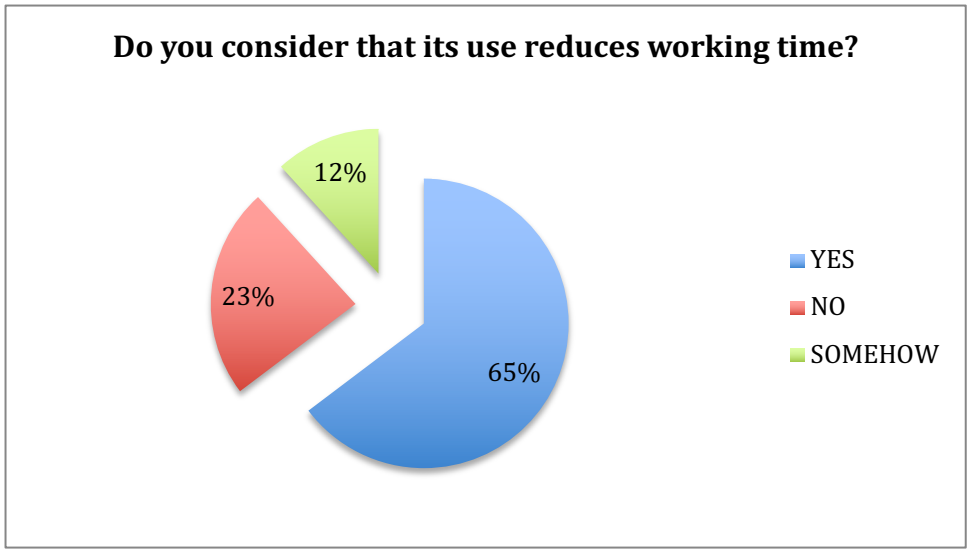


Figure 4: Answers to item "Do you consider that its use reduces working time?"

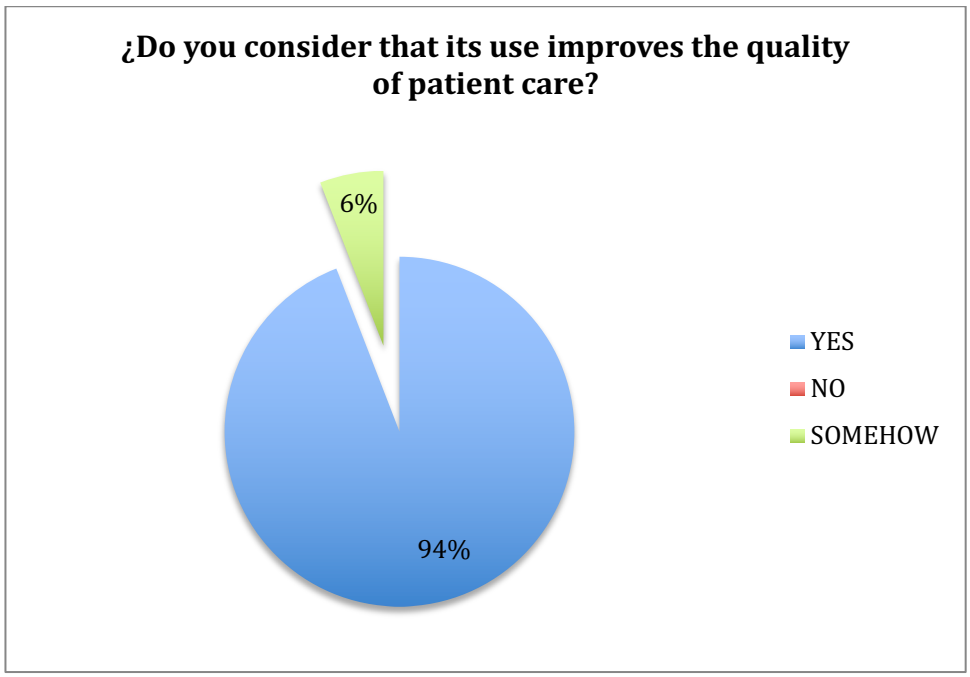


Figure 5: Answers to item "Do you consider that its use improves the quality of patient care?"

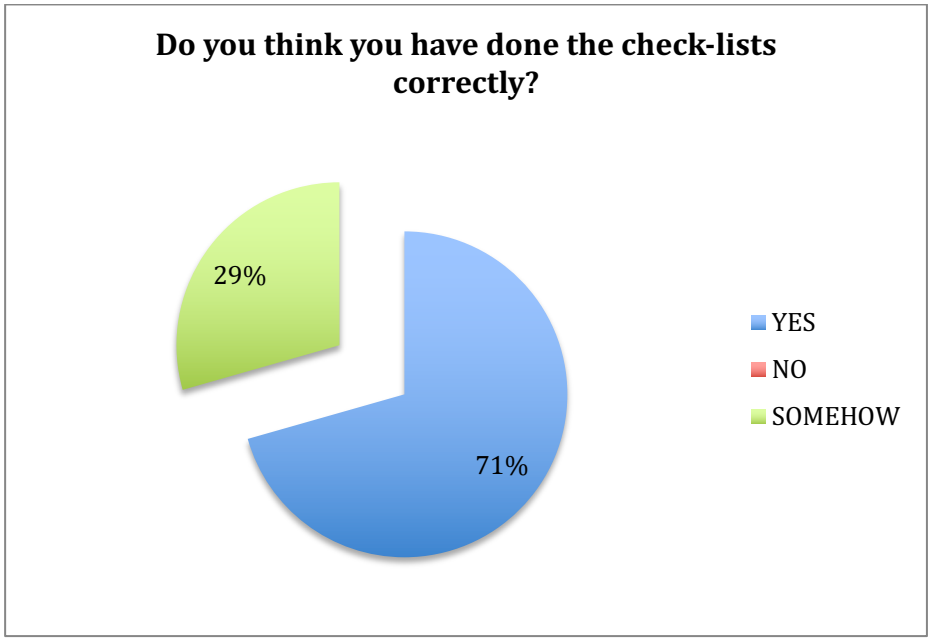


Figure 6: Answers to item "Do you think you have done the checklists correctly?"

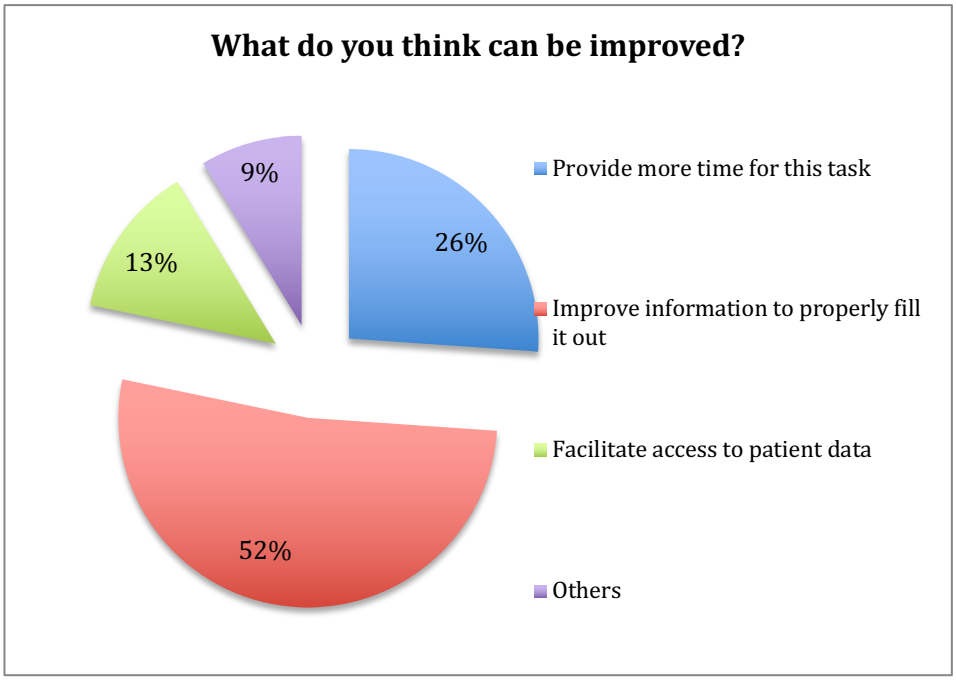


Figure 7: Answers to item "What do you think can be improved?"

5. Discussion

According to the literature there has been many authors that have tried checklist as a tool to improve the surgical treatment with patients (Sleiman et al., 2019), improving in one hand the patients' outcomes, and in the other hand the cost effectiveness of the treatment. In our study the results offer a good value of the checklist for the students and teachers.

In a study conducted by Haugen et al. (Haugen et al., 2019), there were a checklist application on patients and their outcomes were assessed after that. The study was conducted on five different hospital specialties in two hospitals. The processes that were evaluated were respiratory complications, surgical infections, wound rupture, cardiac complications and blood loss. All of them were reduced in the interventions; Postoperative bleeding was decreased as well as intraoperative blood loss, where checklists were used there was a high decrease in need for blood transfusion. These authors advocate for the use of checklist to obtain improved patient outcomes. Compared with our study the students answered that they thought that the checklist could improve the treatment over the patient with a 94% of responses. In our study, there were no variables evaluating the results of the dental treatments, but the treatments that were conducted with the checklist totally filled were reported to be better by the teachers.

In the other hand some studies report conflicting results about the decrease of the complications using checklists. Reames et al. (Reames et al., 2015) conducted a study implementing a checklist before a surgical intervention and observed the surgical and healthcare outcomes. The program, called "Keystone Surgery" was evaluated by gathering data from Medicaid Services and the Center for Medicare.

The checklist was based upon six clinical outcomes: serious complication, reoperation, any complication mortality, readmission and LOS. When comparing hospitals participating in the keystone surgery program to control hospitals revealed no significant decrease of any of the complications following implementation of the checklist. There was a slight increase in risk of serious complications. In our study we didn´t have any complications with the dental treatments, but in the other hand we can see there is a high rate of unfilled checklists, or partially filled, so we suggest continuing with this line of research in order to know more on the complications.

As we said before, as checklist utilization has been associated with decreased complication rates, acceptance for further implementation of such protocols is growing. However, a common criticism of checklists is that they may not be cost effective due to time required for administration. Semel et al. (Semel et al., 2010) performed a decision analysis to determine if implementation of the checklist in the United States reduces costs within the hospital level. We are not sure if there is a economic impact on the use of the checklist in dental education, but we see it as an interesting research line.

One of the most important tools in dental education in order to improve clinical errors are the checklist (Ely et al., 2011) There are many authors that used them not only to improve their clinical traetments but also as an educational tool for the students(Iglesias-Linares et al., s. f.) In our case for the dentistry students. In our study, we made the same structure of the checklist as Iglesias-Linares and other authors in order to achieve a clinical treatment for the students without errors. These authors show in their studies that the checklist reduce the errors in the clinical treatments for the students, as well as in our study. We made the concordance between teachers and students and the data was that the concordance was higher after finishing the procedure.

Other authors as Macluskey M, Durham J, studied how dental students improved their treatments with checklist(Durham et al., 2010; Macluskey et al., 2011). Both authors showed improvements in the student's skills, but their studies have different methodology to ours and they have a lower number of students.

Students opinions on checklist had a high opinion on them according to different authors (Ely et al., 2011; Iglesias-Linares et al., s. f.; Macluskey et al., 2011). They believed checklists are great tools to reduce errors, working time with patients and improve quality in the treatments. This are results similar to our study, with great percentages on students assessments on this items, improvement of quality, and reducing working time.

One of the struggles we saw in our study was the time the students used to fill the checklist, as well as the missing points during the procedures, both causing losing time and loosing data from the patients. We believe that should be a practical training for the students to use this educational tool in order to improve all the aspects of the treatment with the patients.

We also believe that there are some items that can induce to error to the students, so in future studies could be modified in order to help them to make a better treatment.

6. Conclusions

This Project let us to design a learning system that will change the concept of quality control in the dental clinic. The development of checklist in different clinical treatment showed an improvement in some areas for the dentistry students in their last university year. The development of good evaluating tools for the teachers and the students is a valuable resource to help educators and students reduce clinical errors.

With appropriate checklist developed by a group of teachers and supervised by two experts' students were able to evaluate their own procedures and this will generate the teacher's confirmation of the quality of the clinical assistance performed. This is a great achievement in dental education, in order to give students, the capacity of minimized clinical errors.

We also consider that the standardization of procedures and provision of repetitive information in order to better understand the real purpose of these materials, should highlight with the results of our study.

The students remarked that they believe the use of the checklist is a great improvement in the quality of the patient care.

Bibliography

Acosta-Gío, E. (2015). Seguridad del paciente en los consultorios dentales. *CONAMED*, *19*(Suplemento 2014), S14-S417.

Brennan, T. A., Leape, L. L., Laird, N. M., Hebert, L., Localio, A. R., Lawthers, A. G., Newhouse, J. P., Weiler, P. C., & Hiatt, H. H. (1991). Incidence of Adverse Events and Negligence in Hospitalized Patients: Results of the Harvard Medical Practice Study I. *New England Journal of Medicine*, *324*(6), 370-376. https://doi.org/10.1056/NEJM199102073240604

Christman, A., Schrader, S., John, V., Zunt, S., Maupome, G., & Prakasam, S. (2014). Designing a safety checklist for dental implant placement. *The Journal of the American Dental Association*, *145*(2), 131-140. https://doi.org/10.14219/jada.2013.15

Durham, J., Balmer, C., Bell, A., Cowan, G., Cowpe, J., Crean, S. J., Dawson, L., Evans, A., Freeman, C., Jones, J., Macluskey, M., McDonagh, A., McHanwell, S., Millsopp, L., Myrddin, L., Oliver, R., Renton, T., Sivarajasingam, V., Still, D., … Thomson, P. (2010). A generic consensus assessment of undergraduate competence in forceps exodontia in the United Kingdom: A generic competence assessment of forceps exodontia. *European Journal of Dental Education*, *14*(4), 210-214. https://doi.org/10.1111/j.1600-0579.2009.00612.x

Ely, J. W., Graber, M. L., & Croskerry, P. (2011). Checklists to Reduce Diagnostic Errors: *Academic Medicine*, *86*(3), 307-313. https://doi.org/10.1097/ACM.0b013e31820824cd

Iglesias-Linares, A., Yanez-Vico, R. M., & Solano-Reina, E. (s. f.). Uso de una checklist para reducir los errores cognitivos en la enseñanza práctica odontológica. *FEM: Revista de la Fundación Educación Médica*, *16*(1), 31-36.

Macluskey, M., Durham, J., Balmer, C., Bell, A., Cowpe, J., Dawson, L., Freeman, C., Hanson, C., McDonagh, A., Jones, J., Millsopp, L., & Oliver, R. (2011). Dental student suturing skills: A multicentre trial of a checklist-based assessment: Dental student suturing skills. *European Journal of Dental Education*, *15*(4), 244-249. https://doi.org/10.1111/j.1600-0579.2010.00665.x

Perea Pérez, Bernardo. (2011). Seguridad del paciente y odontología / Patient safety and dentistry. *Cientifica dental*, *8*(1), 9-15. Latindex.

Perea-Pérez, B., Santiago-Sáez, A., García-Marín, F., & Labajo González, E. (2011). Proposal for a 'surgical checklist' for ambulatory oral surgery. *International Journal of Oral and Maxillofacial Surgery*, *40*(9), 949-954. https://doi.org/10.1016/j.ijom.2011.04.004

Semel, M. E., Resch, S., Haynes, A. B., Funk, L. M., Bader, A., Berry, W. R., Weiser, T. G., & Gawande, A. A. (2010). Adopting A Surgical Safety Checklist Could Save Money And Improve The Quality Of Care In U.S. Hospitals. *Health Affairs*, *29*(9), 1593-1599. https://doi.org/10.1377/hlthaff.2009.0709

Contribución al artículo:

Los autores Alberto Adanero y Eva Martínez han contribuido con la conceptualización, curación de datos, análisis formal, investigación, metodología, validación y escritura del artículo.

Paloma Planells del pozo ha contribuido con la conceptualización, administración del proyecto y revisión del artículo.

Eva Martínez ha contribuido con la revisión y edición del artículo.

Financiación

No existe financiación de este proyecto.

Contribución de autores

Todos los autores A.A, EM. M.P y P.P. desarrollaron la conceptualización y metodología del estudio; P. P. supervisó el desarrollo del estudio; A.A., EM.M.P. llevaron a cabo la validación y recolección de datos; A.A., EM.M.P. realizaron el análisis de los resultados; Todos los autores llevaron a cabo la redacción del manuscrito. Todos los autores revisaron el manuscrito.

Contribución de autores

% Contribución	*Apellidos*	*Nombre*	*Contribución en el manuscrito*
33,3 %	Adanero Velasco	Alberto	Planificación, diseño, elaboración del manuscrito. Recolección y análisis de la información.

33,3 %	Martínez Pérez	Eva María	Planificación, diseño, elaboración del manuscrito. Recolección y análisis de la información.
33,3 %	Planells del Pozo	Paloma	Planificación, diseño, elaboración del manuscrito. Recolección y análisis de la información. Coordinación técnica de la obra.