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# Impact of a narrative dentistry program among health students: the voxelated curriculum.

# Impacto de un programa de odontología narrativa entre estudiantes de salud: el currículo voxelado.

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**Abstract.**

**Background and objective:** Narrative medicine, originally developed to enhance patient care through storytelling and reflective practices, has recently been adapted to medical education. Its application in dental education remains underexplored. This study evaluates the impact of a narrative dentistry program, integrated into the dental curriculum through a voxelization design, on students' empathy and perceptions. **Methods**: A mixed-methods, single-center observational study was conducted over 26 months at the Faculty of Dental Surgery in Toulouse, France. Forty-two fourth-year dental students participated in a series of narrative-based interventions embedded within existing coursework. Empathy was assessed using the Toronto Empathy Questionnaire (TEQ) at the beginning of the 4th year and mid-6th year. Semi-structured interviews were conducted with 11 students to explore their experiences and perceptions. Quantitative data were analyzed using the Wilcoxon signed-rank test; qualitative data underwent thematic analysis. **Results:** Quantitative analysis revealed a stability in TEQ scores between 4th and 6th years of study ($p = 0.90$). Thematic analysis identified four major themes: (1) variability in student receptiveness to narrative methods, (2) enhanced emotional engagement and realism in learning, (3) reflective writing as a tool for self-assessment and emotional processing, and (4) improved pedagogical effectiveness through voxelization—integrating narrative elements across the curriculum. **Conclusion**: The voxelized narrative dentistry program positively influenced students' empathy and fostered deeper engagement with clinical practice. While not universally embraced, the narrative approach enriched the educational experience by promoting reflection, emotional awareness, and patient-centered care. This study lays the groundwork for broader implementation and further research into narrative pedagogy in medical education.

**Keywords:** medical education, narrative pedagogy

**Resumen.**

**Antecedentes y objetivo:** La medicina narrativa, desarrollada originalmente para mejorar la atención al paciente mediante la narración de historias y prácticas reflexivas, se ha adaptado recientemente a la educación médica. Su aplicación en la educación odontológica sigue siendo poco explorada. Este estudio evalúa el impacto de un programa de odontología narrativa, integrado en el currículo odontológico mediante un diseño de voxelización, en la empatía y las percepciones de los estudiantes. **Métodos:** Se realizó un estudio observacional de métodos mixtos, de un solo centro, durante 26 meses en la Facultad de Cirugía Dental de Toulouse, Francia. Cuarenta y dos estudiantes de odontología de cuarto año participaron en una serie de intervenciones basadas en

narrativas integradas en el trabajo del curso existente. La empatía se evaluó utilizando el Cuestionario de Empatía de Toronto (TEQ) al comienzo del cuarto año y a mediados del sexto año. Se realizaron entrevistas semiestructuradas con 11 estudiantes para explorar sus experiencias y percepciones. Los datos cuantitativos se analizaron utilizando la prueba de rangos con signo de Wilcoxon; los datos cualitativos se sometieron a análisis temático. **Resultados:** El análisis cuantitativo reveló estabilidad en las puntuaciones del TEQ entre el 4.º y el 6.º año de estudio (p = 0,90). El análisis temático identificó cuatro temas principales: (1) variabilidad en la receptividad de los estudiantes a los métodos narrativos, (2) mayor implicación emocional y realismo en el aprendizaje, (3) escritura reflexiva como herramienta de autoevaluación y procesamiento emocional, y (4) mayor eficacia pedagógica mediante la voxelización (integrando elementos narrativos en todo el currículo). **Conclusión:** El programa de odontología narrativa voxelizada influyó positivamente en la empatía de los estudiantes y fomentó una mayor implicación con la práctica clínica. Si bien no fue adoptado universalmente, el enfoque narrativo enriqueció la experiencia educativa al promover la reflexión, la conciencia emocional y la atención centrada en el paciente. Este estudio sienta las bases para una implementación más amplia y una mayor investigación sobre la pedagogía narrativa en la educación médica.

**Palabras clave**: educación médica, pedagogía narrativa, odontología, empatía, currículo integrado.

## 1. Introduction

Originally, the term 'narrative medicine' was used to define therapeutic initiatives for patients (1). These original stories represent a body of work that contains both technical and humanistic information useful to caregivers. It should be noted, that the use of narrative tools in education, and particularly in adult education, predates its development in medical studies by many years (2). The first works in the medical field date from the 1990s (3-4) and the book considered as the founder of the discipline: “Narrative Medicine: honoring the stories of illness” was published in 2008 (5).

This book came out at about the same time as publications in which Dr Charon already outlined the foundations of her theory (6-7). She developed a method for health professionals to improve listening and understanding of patients' stories. However, in recent decades, this listening, which is essential to patient’s care, has seen the time available for its implementation diminish because of the greater reliability and availability of diagnostic and therapeutic means, and the economic pressure on health systems.

The significant progress made in medical diagnosis and treatment, including dental surgery, has sometimes overshadowed the value of a thorough clinical examination or a conversation with the patient. Similarly, Goupy et al. (8) propose a schematization of the effects of economic pressure on the doctor-patient relationship, leading to a reduction in the time spent with patients, and therefore to a feeling, for the latter, of hurried and impersonal care. This pattern can be transposed to the field of dental surgery. Moreover, beyond the negative feelings of patients towards their treatment, this shortened listening can have an even more perverse effect on the quality of care, as it leads to a significant loss of information concerning the psycho-social context in which the patient experiences and interprets the illness.

However, according to Goupy et al. (8) the contribution of narrative medicine isn’t limited to reintroducing the importance of listening to the patient, or to reaffirming the central place of the patient in the care system, in the concept of patient-centered care. The singularity of narrative medicine, as developed by Dr Charon, is to use the tools of narratology to enable practitioners to construct a personal narrative with the patient that allows for adequate and effective care. In doing so, the practitioner develops what Dr Charon calls his or her "narrative competence". This is an additional clinical and medical skill that takes its place in the therapeutic arsenal of health professionals, and is defined by Dr Charon as follows: "the narrative competence to recognize, absorb, interpret and be moved by the stories of illness"(5). To reach these objectives, narrative dentistry may apply the tools of narrative medicine, namely close listening and reading and reflective writing. Close listening and reading are useful for health professionals to learn to receive and better understand stories of illness and care (8). The action of writing, in association with the

other tools, allows us to understand the three movements of narrative medicine: attention, representation and affiliation. For Dr Charon, attention is a position of acceptance of the other that allows access to the patient's world. Representation is the structuring, the fixation on a material support of the information emitted by the patient and captured by the practitioner. Affiliation is the realization of the link between the patient and the practitioner. Dr Charon uses the metaphor of the heart pump with times of rest and opening (diastole) and a time of interpretation and synthesis (systole).

Well-structured narrative courses now exist for medical studies. Recently, the Faculty of Health, Department of Dentistry in Toulouse (France) set up a series of courses dedicated to the person-centered approach with positive results in maintaining empathic capacities (9) or pedagogical effects (10). It is in line with this approach and building on the work of Dr Charon, that we decided to use the narrative approach as a pedagogical tool in the context of oral health. This pedagogical innovation was designed with the primary aim of fostering moral sensitivity, empathy, and professionalism among dental students. It responds to a growing need to humanize clinical education and to prepare future practitioners for patient-centered care revealed by our previous studies (10-11). The implementation of this program was supported by the curriculum committee of the Department of Dentistry of the Faculty of Health, which identified a gap in emotional and reflective training during clinical years. The voxelized design was thus introduced as a strategic opportunity to integrate narrative elements into existing teaching modules without overloading the curriculum.

## 2. Methods

### *2.1 Objective*

The main objective of this work was to evaluate the impact of a new narrative dentistry curriculum on students in terms of development of empathy and to determine their views on the usefulness of this type of teaching.

### *2.2 Research methodology*

This was a single-centre observational study conducted at the Departement of Dentistry, Faculty of Health in Toulouse (France). The analytical approach was mixed, quantitative and qualitative, an approach adapted to understand social phenomena in the health field, and already used in dental practice (12). Regarding the constitution of the sample, it was decided to include students who had followed all the narrative interventions. The sample was chosen for fourth year students, as they are just starting their clinical activity. The sample was selected as follows: all fourth-year students who agreed to participate in all interventions were included. The exclusion criteria was that students did not wish to participate in the study, or no participate to all the interventions. The number of students in the 4th year was 82. Longitudinal follow-up was organized over a total period of 26 months. Finally, the number of students who participated in all inventions, was 42. The number of students who responded to the questionnaires at the beginning and end of the study was 30. The following flow chart gives an overview of the inclusions and reasons for discontinuing participation in the study (figure 1).

### *2.3 Data collection*

Students who participated in the first intervention completed a self-reported empathy questionnaire at the beginning of their 4th year of study: the Toronto Empathy Questionnaire (TEQ). This questionnaire has been validated in the French language and have been used previously in the field of dentistry (11, 13). Students who had completed all the interventions, including the writing of parallel charts were asked to complete the same questionnaire at the middle of their 6th year of study.

The individual interviews were conducted in the dentistry department, in XXX (XXX). We conducted semi-structured interviews with a minimum sample of 8 students, which was set a priori, and which could evolve as data saturation was reached. The discussions were conducted in French and lasted between 20 and 30 minutes. To stimulate discussion and the emergence of ideas,

a dialogue framework was set up by two investigators (MM and JNV). The interviews started with questions about the general organization of the teaching, followed by questions about the potential effects of the new teaching tool on students, and then continued with possible proposals. The individual interviews were carried out following a call for participation sent by e-mail to all the students in the selected sample. 7 students responded favorably and 11 others were invited to the interview in a random way in order to reach thematic saturation. One evaluator was in charge of the sample collection (MM).

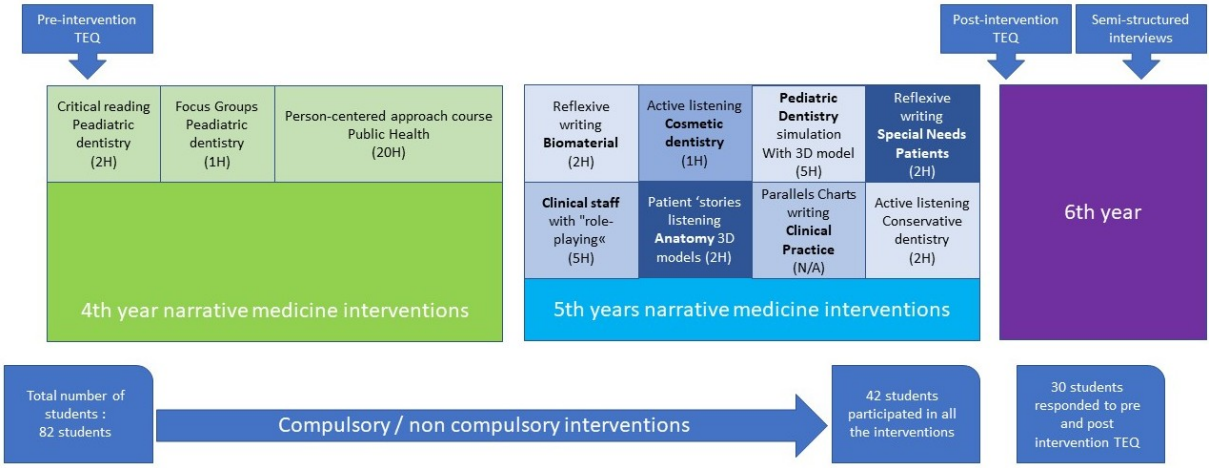


**Figure 1.** Flow chart of participation and interventions tested in the study

*2.4 Data Analysis*

TEQ scores were entered into Excel® (Microsoft, Mountain View, USA) and analyzed using R® software (Bell, Murray Hill, USA). The non-parametric test of Paired Wilcoxon was used to compare the distribution of pre-test and post-test values between the two groups for the questionnaire. The significance level was set at 5%. The assumptions for the Wilcoxon signed-rank test were verified prior to analysis. In particular, the symmetry of the distribution of differences between paired scores was assessed visually and statistically, confirming the appropriateness of the test. The qualitative analysis complies with the recommendations of the COREQ checklist. A thematic analysis of the verbatims from the individual interviews was carried out. Collection and analysis continued until data saturation and stability of findings was achieved. The interviews were recorded and then transcribed by word processing for analysis. The thematic analysis was carried out in several stages:

1) Debriefing of interviews with co-researchers and writing of an interview report (comments written by the investigator immediately after the interview to summarize it, identify new hypotheses, and prepare for the next interview).

2) Transcription of interviews, reading and re-reading of data.

3) Coding of data, and grouping of data affiliated to the same code. The Nvivo software (QDR international, Cambridge, MA, USA) was used for coding. Theme extraction was grounded in the data, using verbatim quotations and coding logs. Codes were derived inductively and grouped into themes through iterative analysis using NVivo software. Two researchers (MM and JNV) independently coded the data before comparing their results.

4) Grouping of the different codes into general themes, following the analysis, without a priori determination.

5) Organization of themes (modifications, mergers and/or deletions).

6) Description of themes and illustrations with data extracts.

7) Analysis report, interpretation and discussion in relation to the research objectives. A third researcher (MCV) performed external validation by presenting the results to some participants.

*2.5 Ethical considerations*

This study was ethically approved by the Head of the Department of Dentistry of the XXX Health faculty under number MR-004 RnIPH 2023-119. Prior to the start of the interview, the students gave their consent based on the following information:

- anonymity of participants (transcripts not showing names of participants or third parties, or events that could identify the student).
- The student has been informed that anything he/she says during the interview will only be used for anonymous analysis of the results, without any possible consequences for his/her future assessment.
- recruitment based on voluntary work (possibility to refuse).

*2.6 Interventions tested. The voxelization design of teaching*

The students benefited from a variety of interventions over the two years, in several disciplines of dentistry, at university and hospital level: critical reading of news, discussion groups, role-playing, evaluation by patient and not by acts, reflective writing, narrative clinical "Staff", writing of parallel files. These interventions are summarized in table 1. These different interventions therefore take place throughout the two years of student follow-up. Some of those intervention's effects have been previously published (9,10). With the exception of the person-centered approach courses in the 4th year, it is notable that the narrative approach is only one aspect of these sessions and that it comes as a complement to or in support of another subject. The narrative pedagogy used in this program is not a free-form use of storytelling, but rather a structured application of the principles of narrative medicine as defined by Dr. Rita Charon. The interventions followed the three core movements of narrative medicine—attention, representation, and affiliation—through close reading, reflective writing, and storytelling exercises. Materials included short stories (e.g., "Love Abuse" (14), "Time loss"(15)), reflective writing prompts, parallel charts, and video testimonies. These were selected to evoke emotional engagement and to simulate real-life clinical situations.

Here we can highlight the specificity of our approach and its adaptation in the field of dental surgery. Indeed, at Paris-Descartes University (France) for example, courses have been designed specifically for the transmission of narrative competence (8). We have chosen, in the dental context where the organ specificity is very early in studies, to integrate the narrative dimension within the conventional teaching. It is this new pedagogical design that we have called "the voxelization of the curriculum" in dental surgery. Indeed, if we take the dental surgery curriculum as an image, this image is composed of small elements, the pixels. Here, the pixels are the lectures, practical and directed work and clinical teaching received by the students. Rather than adding an additional pixel "narrative dentistry", the choice was made to add the narrative dimension to the pixels already present, this new dimension giving no longer a two-dimensional image but a three-dimensional object: this is the creation of the voxel, hence the term "voxelization" (figure 2).

**Table 1.** Summary of narrative interventions with students

| Intervention / Discipline | Hourly volume |
|---|---|
| **4th year** | |
| Critical reading of short stories: "Love abuse" deals with severe childhood caries linked to breastfeeding<br>"Time loss" is a short story about the importance of esthetic restauration among adolescents. | 2h (2 sessions) |
| Focus Group<br>Discussion about the protective stabilization of children during pediatric dental cares (16). | 1h |
| Person-centered course (9) | 20h |
| **5th year** | |
| Reflective writing + Reading / biomaterials<br>Writing sessions with patients focusing on biomaterials (amalgam and bovine bone substitutes). Followed by readings and discussions. | 2h (2 sessions) |
| Clinical staff with "role-playing" / multi-disciplinary: conservative | 5h (10 sessions of 30 |

| | |
|---|---|
| dentistry, parondontology... | minutes) |
| Cosmetic dentistry course with video testimony. Video testimony of a teenager who attempted suicide following bullying at school, which began with teasing about her teeth. | 1h |
| Narrative anatomy lab: 3D model. Stories of real patients who underwent surgery for benign tumours using 3D-printed models based on pre-operative scans. | 2h |
| Pediatric dentistry lab with 3D model + patient story<br>Stories of real pediatrics patients who underwent sdental cares for severe infectious dental complications using 3D-printed models based on pre-operative scans. | 1h |
| Parallel charts writing<br>Writing of brief accounts of care in which students can express their feelings and emotions towards patients and treatments. They are, therefore, intended to collect practitioners' feedback in the form of "narrative" tools to encourage reflection (10). | N/A |
| Reading and group discussion of short stories written by practitioners or patients (17). | 4h (8 sessions) |
| Narrative Dentistry Course / Special Needs Patients<br>Readings of student testimonials on their perceptions of dental care shifts with patients with special needs. | 2 hours |

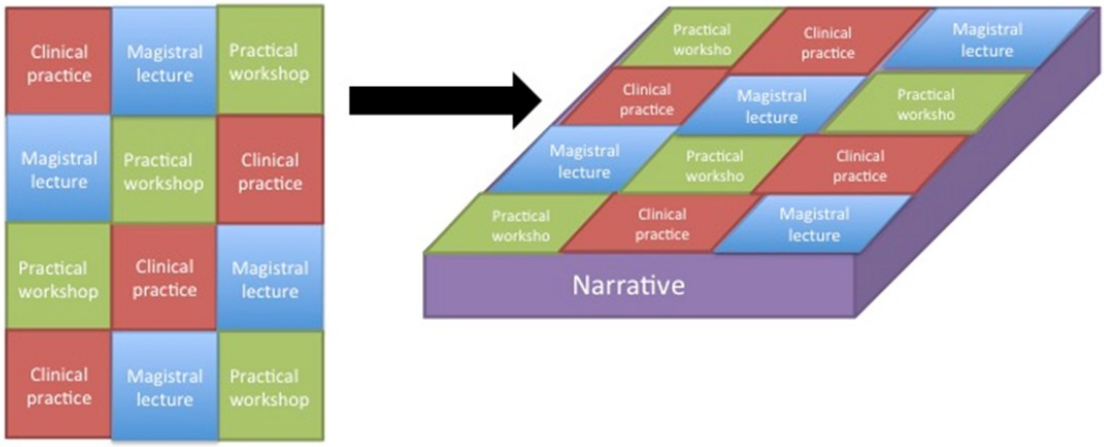


**Figure 2.** Voxelisation of the medical curriculum

## 3. Results

*Analysis of quantitative data from TEQ test*

Univariate analysis: The mean and median TEQ scores are almost stable on the pre- and post-intervention tests (table 2). Statistical analysis was conducted on paired TEQ scores before (T0) and after (T1) the intervention (n = 30). The Wilcoxon signed-rank test yielded a non-significant result (exact p-value 0.588), indicating no statistically significant change in empathy scores. The mean difference between T1 and T0 was approximately -0.63, with a Cohen's d of -0.16, suggesting a small effect size. The 95% confidence interval for the mean difference ranged from approximately -2.1 to 0.8, confirming the absence of a meaningful shift. The effect size r was estimated at 0.32, indicating a modest but non-significant impact of the intervention.

**Table 2.** Self-assessed empathy test results

| **TEQ** | | | | |
|---|---|---|---|---|
| | Pre-intervention | Post-intervention | | |
| Mean | 47.8 | 47.5 | p-value | = |
| Median | 49.5 | 49 | 0.588 | |
| Standard deviation | 5.2 | 5.4 | | |

*Results of the thematic analysis of the interview verbatims (table 3).*

In this study, interviews were conducted until thematic saturation was reached, at the 11th interview. When asked about the use of storytelling in teaching, students offer their perceptions of this new teaching tool with its strengths and limitations. As summarized in table 3, the themes addressed range from the interest in acquiring skills to a better understanding of the patient-practitioner relationship and the role of the carer.

*"Some people don't give a damn": An approach not suitable for all students*

The reading of patients' or relatives' stories was not considered realistic by some students: "it doesn't seem very realistic to me, so I didn't feel very involved" (Student 3). Furthermore, still concerning the close readings during the lectures, some students found it difficult to make the link with the lecture itself: "it's difficult to make the link with the lecture data" (St 1). This discrepancy between the narrative and the theoretical notions transmitted by the teacher was also reflected in the idea that the information given by the narrative was less valuable than that of the course: "I really like the lectures, in my opinion it is more 'real'". (St 1). Moreover, this pedagogical approach is not adapted to all profiles: "It depends on the perception of the students, there are some for whom it will open their eyes and others who will say 'I don't give a damn'" (St 2). Sometimes it is the feeling that this type of course is useless that dominates: "Maybe we wonder a bit about the usefulness of all this, because directly we are (St 4). Despite the explanations given, some deplore a lack of framework in the conduct of these lessons, in particular reflective writing, which is a difficult exercise: "It's a pity that we didn't have one or two methodology lessons because I had difficulty writing, I thought, to help me to orientate my ideas. Finally, to help me express them. It was difficult in the form, the ideas I had" (St 3). "It's difficult to write in the place of patients when you have no experience, because everything comes into play: the socio-economic environment, the culture, everything, and I don't yet have this clinical experience that tells me: there is such and such a response that will appear" (St 7). Beyond the methodological aspect, the practice of writing, in particular the parallel files, requires a lot of work which is not to everyone's taste: "Frankly, the parallel files were a bit boring, because it's quite long, it's complicated, and you have to make it interesting" (St 8). For those who completed the different exercises, this work is sometimes of no interest: "For me it was a bit fictitious, it's simulated so I don't feel more empathetic" (St 10).

*"It puts me in a realistic emotional situation". The narrative approach brings concreteness and humanity to university teaching:*

Close reading and reflective writing can be seen positively as exercises that provide another way of working: "Personally, I had difficulty choosing between science and literature, so when I heard about it I was pleased because I have always liked literature, for me it was a way of being a little bit involved in literature and art, while remaining in the studies we were doing and the job we were going to do, which is always good" (St 6). They are also an opportunity to benefit from real feedback: "We don't necessarily have access to the experiences of dentists, except if we know such and such a dentist, but reading them makes us share experiences, without having to ask, especially as in writing it is much more focused on what this experience has brought to the dentist who wrote, advice"(St 6). On the subject of reading short stories to illustrate a theoretical notion in a course, students may feel that "it (gives us) a concrete case to think about" (St 1). Similarly, it "allows us to deal with a real clinical situation" (St 9) or "it puts us in a realistic emotional situation" (St 4). Thus, students can put themselves in the shoes of patients by reading these stories or by writing themselves: "There are many patients who do not think like us, who have beliefs and so on, and if

we do not put ourselves in their shoes, we will say to ourselves, 'the patient is a pain in the ass or I don't know'" (St 5). Concerning the interest of bringing this narrative dimension into lectures and tutorials or practical work on clinical practice, some students consider that it gives them tools to deal with certain situations: "From the point of view of clinical practice, I think that it allows us to react better to certain patients at the end of the day, for example if we have a patient who refuses... perhaps we will be closed off, whereas if we put ourselves in the patient's place, by writing a short story, it will take us a certain amount of time, and we will be less closed off when dealing with certain patients" (St 2).

*"It's a bit like a diary": the narrative approach allows for reflection on oneself and one's practice.*

Narrative medicine, through its two main tools of reading and writing, gives students the opportunity to write about their feelings as young carers: "It was interesting to write down our feelings because we don't talk about them, we talk about them between ourselves, between pairs, but afterwards with the teachers or the other students we don't really talk about our feelings. So, it's good to write what you think" (St 5). Thus, writing and sharing in the reading sessions helps to cope with the stress of caring for patients: "Afterwards, for me, it was the idea of listening to others, of knowing how their experiences are going, the relationship with their patient, how it is going, how they manage stress in a particular situation" (St 7). These sessions are also an opportunity to take a self-evaluative look at one's work and professional attitude: "Yes, to see how we managed the patient, the act, if we reread it later, to see how we would have managed it differently, to see how we are evolving on the relationship with the patient perhaps" (St 5). This aspect is particularly marked with reflective writing and therefore parallel files: "It's interesting because we put ourselves in the patient's place, and it allows us to take a step back on the way we carry out our consultations, to replay the film of the consultation and it allows us to see the points we need to change" (St 11).

*"It's not like an impersonal lecture, it's a real-life experience": Voxelization design has a positive pedagogical effect.*

The design seems to suit the students, rather than specific courses dedicated to narrative: "No, it's important, because we don't do it too much, to put ourselves in the place of the patients, but rather integrate it into other courses like we did, not a course dedicated to that. For example, integrating courses before the clinical years with a narrative part, that would interest people more, courses dedicated to narrative can lose students"(St 5). The students interviewed indicated that the presence of a story in the sessions made them easier to follow: "It's more interesting like that, maybe we retain it better, the PowerPoint is very boring, sometimes we don't listen too much, we don't look, but here it's more interesting" (St 8). But above all, the fact of integrating a story and emotion allows, according to some participants, to be more attentive during the lessons: "it allows us to concentrate more, to have the theory and then the application in the form of a story, to be more interested in the theme" (St 5). The fact of being more attentive also leads to students remembering the information given during the course better: "It allows... I think that in the brain it is memorized better than just a theoretical course that you have to learn. This way of teaching interested me and it can be the fact that I learn it or that I memorize it better than if it had simply been a slide" (St 6). The fact of remembering a situation seen in class by means of the narrative finally enables some to adopt a more empathetic professional attitude: "If I had had a classic course it would have had less impact on me, well I would have ended up forgetting, whereas with the narrative, when I have patients who present themselves in this case I am less quick to judge people, whereas if I had a course such as 'you must not judge people' I would have forgotten it" (St 10). Regarding the structure of the lessons, students indicated that the voxelization design suited them because it mixed the narrative with the more conventional lessons: "It's good to combine the two, you can start with the narrative part, and afterwards still come to a conclusion with the key points" (St 11).

**Table 3.** Table of themes and quotes reflecting students' perceptions of narrative dentistry.

| Themes | Subtopics | Quotes |
|---|---|---|
| Design not suitable for all students or not effective | Difficult exercises / lack of habit | • "To write in the patient's place, it requires an effort, to put yourself in the patient's head, it's true that it's not very easy. For me it wasn't easy" (St 6). |
| | No relevance to | • "Frankly, it would be better to have clinical protocols |

| | | |
|---|---|---|
| | future clinical practice<br><br>No effect on empathy | that are well adapted to clinical situations" (St 3).<br>• "It's nice, we discuss but not necessarily at the level of knowledge, because in the end it's not technically oriented, the parallel files" (St 8).<br>• "For me it was a bit fictional, it's simulated so I don't feel more empathetic" (St 10). |
| The narrative approach puts the concrete and the human into university teaching. | Real-life feedback<br><br>Allows you to put yourself in the patients' shoes | • Sometimes I would ask questions: Am I under too much stress? Is it me? Is it the others? Do others react better to stress than I do? Sometimes there are other things to hear that can be beneficial for me, to know how to handle a situation? Especially with teachers, it's a way to know" (St 7).<br>• "it allows you to put yourself in a realistic emotional situation" (St 4).<br>• "After putting yourself in the place of a patient who has his own life, who does not necessarily know the care that we are going to carry out, it allows you to put yourself in the place of the patient, to understand his needs and to treat him better (St 6). |
| The narrative approach allows for reflection on oneself and one's practice | Provides benchmarks<br><br>Allows you to write down your feelings<br><br>Has a self-evaluative role | • "It gives me confidence, because there is always a mistake and when it happens I say to myself that it's not that I don't know how to do it, that I'm bad, it happens to others and you have to accept it, it gives you a reference point" (St 7).<br>• "It allows you to... like a diary a bit, to write down what you feel, I don't know, it can relieve you (St 6).<br>• "For me it was really my personal reflection, how I would have acted, how to manage, and see with hindsight. Sometimes telling what you think allows me to understand better, with hindsight to say yes, it's true, I see that it's better. Sometimes seeing the reasoning, it allows me to reflect, to go back, to take it back and say ok if you see things in this way (St 7).<br>• "See how we managed the patient, the act, if we read it again later, see how we would have managed it differently, see how we evolve on the relationship with the patient maybe" (St 5). |
| The voxelisation design has a positive pedagogical effect. | A story is given great importance.<br><br>Integrating narrative into other courses is interesting<br><br>Fundamental knowledge conveyed through storytelling is better retained | • "When it's a "true" story in quotes I think it's more important, because we have a lot of recommendations, and something like this makes a difference (St 9).<br>• "The way in which a piece of knowledge is brought to us influences whether we will retain it or not and I think that the better it is brought to us the better it will be retained. Because even if we have the mid-term exams at the end of the year we can go and revise but we tend to use our short memory for the mid-term exams whereas here it stays in our memory (St 7).<br>• "In the courses we are flooded with information, and to put it in narrative, the information we associate a little bit with like feelings or .... Feelings and that can help to retain certain notions (St 10). |

## 4. Discussion

This study consisted in the follow-up of a class of dental surgery students at the Faculty of Toulouse for two years, from the beginning of the 4th year to the beginning of the 6th year. This is a pivotal stage in the study of dentistry because it corresponds in France, to the beginning of the

students' clinical practice. It is also a period that has been particularly studied from the point of view of the students' self-assessed empathy. Indeed, as previously mentioned, self-assessed empathy scores generally decline throughout dental surgery studies, especially when students begin to be in contact with patients (13), even though the third year seems to show the most significant decline among medical students (18). One of the aims of this work was to determine whether narrative medicine applied to dentistry (narrative dentistry,) proposed through the voxelization design of teaching, could have an impact on self-assessed empathy. We can see that TEQ scores before/after are almost stable, with a non-statistically significant difference on the thirty (30) students who completed both tests and all the interventions, including the non-compulsory lessons. This is an encouraging result, as studies have shown a decline in empathy during medical and dental studies (19-20). This is in line with continuing and disseminate narrative dentistry, although, as we shall see, the development (or maintenance) of empathy is not the only objective of narrative medicine, Dr Charon designed narrative medicine with the aim of developing narrative competence (the competence to recognize, absorb, interpret and be moved by stories of illness).

It is difficult to relate these results to those obtained in other programs in medicine. Indeed, to our knowledge, we are the first faculty of dental surgery to implement a narrative dentistry program with this design. However, our study resonates with the work of Huang et al. (2021), who explored the integration of narrative medicine into dental education in Taiwan. Their conceptual framework emphasized the triad of attention, representation, and affiliation, and highlighted the importance of reflective writing, storytelling, and parallel charts in fostering empathy and holistic care. While their approach was implemented through structured modules in ethics and humanities, our voxelized curriculum embedded narrative elements across clinical and theoretical teaching. Both studies underscore the transformative potential of narrative pedagogy in shifting dental education toward a more humanistic and patient-centered model (21). Our findings align with recent research by Huang et al. (22), who integrated narrative medicine into undergraduate orthodontics education. Their study demonstrated significant improvements in empathy and clinical evaluation scores among students exposed to narrative-based teaching. While their approach was more discipline-specific, our voxelized curriculum similarly embedded narrative elements across various dental disciplines, aiming to foster emotional engagement and reflective practice (22). Those findings are consistent with the study by Huang et al. (22), which explored dental students' perceptions of narrative medicine as a tool to enhance performance in OSCE standardized patient stations. Their results showed that students believed narrative medicine improved core competencies such as communication, professionalism, and patient care. While their study focused on simulated clinical assessments, our voxelized curriculum similarly aimed to embed narrative practices throughout real clinical and academic settings. Both approaches highlight the value of narrative pedagogy in strengthening interpersonal skills and reflective capacity, suggesting its relevance not only in evaluation contexts but also in everyday clinical education.

As far as medical studies are concerned, the University of Paris-Descartes (France) has been the pioneer in Europe in this field, offering a structured program, first as an option and then compulsory since 2012. It consists of 20 hours of training including reading and writing and discussion sessions (8). Goupy et al. report that their study found no statistically significant difference between a group of students who received the program and a control group, with no detailed information. Although a Chinese study of nursing students showed a positive effect of a narrative medicine program on self-assessed empathy test (23), most studies show little or no effect on self-assessed empathy, (24). However, these authors express the view that measuring the effects of narrative medicine using quantitative methodology is not relevant. For example, Neumann et al. (2010) have shown that social desirability bias is important, and that many other parameters, such as biographical events, can be considered as components of empathy. For this reason, as explained in the justification of the methodology of our study, we chose to also use a qualitative, thematic, analysis to explore in depth the potential effects of our narrative dentistry program. To our knowledge, this is the first time that a thematic analysis has been conducted on the subject of the impact of narrative pedagogy with students. Among the themes discussed, the fact that narrative dentistry is not effective or appropriate for everyone was found in most of the work on the subject in other health fields. This was the case for Goupy et al. who stated in the book 'Narrative medicine: a pedagogical revolution?' that '(students have) contrasting assessments for reading patient stories'

(8). We are also aware that it is difficult to convince the medical community of the clinical usefulness of this tool, and therefore of the pedagogical interest of narrative medicine. Indeed, this is the request of a student who wants "to have clinical protocols" (St 7) and therefore does not seem to understand the interest for a surgical discipline of narrative competence. Dental surgery students are not used to writing. In France, the mode of selection and the evaluations, essentially based on Multiple Choice Questionnaires, are not conducive to writing. It is therefore an effort that is required and for which some participants were neither prepared nor asked for this creative writing approach. However, one of the objectives of narrative competence is to be moved by the stories of illness. As such, emotion plays an essential role in this process and this idea is echoed in the interviews, as it allows "putting oneself in a realistic emotional situation" (St 4). Reading patients' stories will lead students to put themselves in the patients' shoes. It is therefore understandable that this is a relevant way to achieve the objective of developing empathy, in its emotional and cognitive components. Moreover, these real-life experiences make it possible to "bring the patient" into university teaching, and these concrete stories can be meaningful for students. Indeed, we have seen that students sometimes have difficulty positioning themselves as caregivers, and being moved can make them aware of the important role they have to play, not only in the health of patients but also in their own quality of life.

This is also the meaning of the testimonies of other practitioners and students, which give the participants the possibility to compare their own experience or to project themselves in a practice they do not know yet. These readings provide benchmarks for their peers or teachers and can be reassuring. This comparison is also quite similar to self-evaluation practices, and this is particularly true for writing when it takes place in parallel files. This self-assessment can be related to the relationship with the patient but also on a more technical dimension such as the diagnostic approach, "to see the reasoning" (St 7) of the management of the patient. The parallel files therefore allow students to take a critical look at their work, and this is particularly true for the psycho-behavioral management of patients. Indeed, the quality of the procedures is frequently evaluated, whether during the practical work or the clinical sessions. On the other hand, the evaluation of the relationship they establish with their patients is not evaluated, and the parallel files are an opportunity for them to evaluate themselves in this field, but also, for the first time, to see and talk about themselves as carers. The parallel record writing is also an opportunity for the students to write down more personal information, such as their feelings about the patients and the work. It is a bit "like a diary" that can "relieve" (St 6). This theme can be related to the usefulness of narrative medicine in preventing burnout, which was described by Sands et al. in a pediatric care team (24).

Indeed, the drafting and subsequent group discussions are an opportunity for participants to express their difficulties and doubts and to confront them with their colleagues. The analysis of the parallel files is rich in information on the way students perceive and practice their clinical activity in the framework of their training (10). The way they talk about the disease, with technical terms and a disease-centered approach, shows that they do not necessarily have the distance to understand the consequences of oral diseases on children, despite the voxelization of the teaching. The stress of performing technical procedures and dealing with the behavior of young patients is probably a factor. However, when it comes to talking about the child himself and the relationship that is established, the majority of the files show that the patients are listened to attentively and that the overall context is considered, which is proof of the impact of patient-centered medicine teaching. Similarly, when dealing with patient anxiety, the students were more likely to describe an empathetic attitude, using methods learned during the theoretical courses.

Beyond the interest in the development of empathy or the effects on professional attitudes, one of the themes discussed during the interviews was the pedagogical effect of the voxelization design. Indeed, in this design, the stories are distilled throughout the lessons in "small touches" to bring an additional dimension. Students seem to be sensitive to this way of sharing knowledge, as "the way the knowledge is delivered" is important and "influences whether it is retained or not" (St 7). It is the authentic, "real" character of the story that makes it "more important" (St 7). Students will retain more information and, more importantly, become more involved, which will undoubtedly have an effect on the results. This is also reflected in the study of Huang, in which participants in the test group, who received a narrative medicine program, performed better in examinations than the control group (22). Thus, the present qualitative analysis provides information for the first time,

bringing the students' perceptions to the fore. Without minimizing the difficulties encountered and the friction that arises, students have a positive view of this narrative dentistry program. The effects on self-assessed empathy are real, both quantitatively and in terms of the themes discussed in the interviews. This narrative pedagogy, allows reflection on oneself and one's practice, it is both a self-evaluative practice and an opportunity to express one's difficulties. Finally, this design seems to have a positive impact on the way technical and practical information is given and acquired. The feedback collected through interviews provides valuable insights for future improvements. Students expressed the need for clearer methodological guidance in reflective writing, suggesting the addition of preparatory sessions focused on narrative techniques. Others recommended integrating narrative elements earlier in the curriculum to build familiarity. Based on these suggestions, future iterations of the program will include introductory workshops on narrative writing and a progressive integration of narrative tools from the preclinical years onward. Several alternative explanations for the observed changes in empathy scores were considered, including the natural maturation of students over time and the potential influence of individual instructors. Maturation effects, such as increased clinical exposure or personal development, could theoretically contribute to shifts in empathy. Similarly, variations in teaching style or interpersonal dynamics with faculty members might have impacted students' perceptions and responses. However, the longitudinal design of the study, spanning multiple academic years, and the deliberate integration of narrative elements across a diverse range of disciplines and instructors, help to mitigate these potential biases. By embedding narrative pedagogy within existing curricular structures rather than isolating it in standalone modules, the program reduced the likelihood that outcomes were driven by a single educator or moment in time. This distributed and embedded approach strengthens the internal validity of the findings and supports the interpretation that the observed effects are attributable to the pedagogical design rather than external confounding factors.

While the study was conducted in a single institution, the voxelized design is adaptable and could be implemented in other dental schools or health education settings. The modular nature of the interventions allows for contextual customization, enhancing transferability.

## 5. Conclusions

- A narrative medicine program was performed among dental students with a new pedological design called “the voxelated curriculum” This lead to a stabilization of self-evaluated empathy. A thematic analysis demonstrated that this design, although not suitable for all students, lead to an enhanced emotional engagement and realism in learning, self-assessment and emotional processing, and improved pedagogical effectiveness.
- Attentive listening, which is one of the pillars on which narrative competence is based, leads to better information, more accurate decisions and a more balanced relationship between the carer and the patient. It is part of the answer that narrative medicine applied to dentistry can provide. In addition to listening, narrative competence develops analytical skills, both in the care relationship and in the medical data, and allows for a self-evaluation of one's practice. From a pedagogical point of view, by proposing realistic situations during the lessons, it allows a greater involvement of the students, and will have a positive effect on self-assessed empathy.
- Reflective writing, in addition to the effects mentioned above, will give practitioners the opportunity to express their feelings, both positive and negative, and the construction of this individual narrative will influence their future action. It therefore repositioned the patient-practitioner pair at the center of the care system, and armed practitioners to face the important changes in the field of oral health.
- To provide more than knowledge alone, the narrative dimension can be included in the structure of the teaching itself. For clinical disciplines, this contribution must be made according to the three axes of the narrative: the cognitive, which carries the technical message, the emotional, which inscribes this message in the learner's frame of reference, and the spatio-temporal, which situates the information in a framework of achievement. These three axes, which could also be described as dimensions, still offer a volume, an object, which is more tangible, which can be handled by the learner and which can easily be compared to the skills reference frameworks.

- The research on narrative dentistry is only at its beginning; this work aimed to lay the foundations for future reflection on the integration of the narrative dimension in oral medicine teaching. It is now up to teachers to take ownership of the subject in order to help students and young practitioners construct, or rather write, their own training narratives and ultimately the history of their professional identities.

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