

Comparison of undergraduate dental education in Aarhus, Brescia and Tromsø

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Table of content

Acknowledgement.....	4
Abstract	5
1.0 Introduction	6
2.0 Material and methods	7
3.0 Results	8
3.1 Denmark and Aarhus	8
3.1.1 Oral health care system	8
3.1.2 Dental education in Denmark and Aarhus	8
3.1.3. Curriculum	9
3.1.4. The student clinic and the clinical work	11
3.1.5 Patients and their treatment needs.....	12
3.1.6 Interview of dental students in Aarhus	13
3.2 Italy and Brescia	14
3.2.1 Oral health care system	14
3.2.2 Dental education in Italy and Brescia	15
3.2.3 Curriculum	16
3.2.4 The student clinic and the clinical work	17
3.2.5 Patients and their treatment needs.....	18
3.2.6 Interview of dental students in Brescia	19
3.3 Norway and Tromsø	20
3.3.1 Oral health care system	20
3.3.2 Dental education in Norway and Tromsø	21
3.3.3 Curriculum	21
3.3.4 The student clinic and the clinical work	23
3.3.4 Patients and their treatment needs.....	24
3.3.5 Interview of dental students in Tromsø	24

4.0 Discussion	26
4.1 Oral health care system.....	27
4.2 Universities and dental education.....	27
4.2 Curriculum.....	28
4.3 The student clinics and the clinical work	29
4.4 Patients and their treatment needs	31
4.5 Conclusions	32
5.0 References	33
6.0 Appendix	35
6.1 Appendix I – Interview questions.....	35
6.2 Appendix II – Curriculum Aarhus.....	37
6.3 Appendix III – Curriculum Brescia	41
6.4 Appendix IV – Curriculum Tromsø	44

Acknowledgement

This master thesis was carried out during our undergraduate dental education on 4th and 5th year, at the Faculty of Health Sciences, UiT – The Arctic University of Norway. We wanted to write about the undergraduate dental education in Aarhus (Denmark), Brescia (Italy) and Tromsø (Norway), and compare, if possible, similarities and differences between the educations at the different universities. We were both exchange students during our spring semester on the 4th year, Gøril in Brescia and Anette in Aarhus. We already had some information about some similarities and differences before we left Tromsø, but we wanted to find out more and write our master thesis about it since a lot of it would be based on our own experiences from our exchange period. We would like to express a great thank you to our supervisor, Eeva Widström, professor, ph.D., at the Institute of clinical Dentistry, UiT – The Arctic University of Norway, for helping us and supporting our work. She has done an incredible job reading our drafts, given us constructive feedback and helped finding relevant references. We would also like to thank the universities in Aarhus and Brescia, their dental practitioners, specialist, professors, teachers and the administrative staffs for letting us stay and for being a part of their education of undergraduate dental students. Also a huge thank you to our co-students in Tromsø, Aarhus and Brescia, for helping us with our work and for making our exchange period such a great experience.

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Abstract

The aim of this work was to compare undergraduate dental educations at Aarhus University in Denmark, at the University of Brescia in Italy and at the University of Tromsø – The Arctic University of Norway and see if the students have different preconditions at graduation.

Information about the curriculum and study subjects and oral health provision systems was collected from reports and articles. Observation was used as method when studying clinical teaching and patient treatment. In addition a number of students were interviewed regarding their opinions and experiences of their studies.

Through our work we found out that the three different dental educations were rather similar as regards the theoretical contents in the education. There were also differences, especially when it comes to when the odontological subjects were introduced and how the clinic training was organized. The latter was related to the oral health care provision system in the country.

At some of the schools the students felt that theoretical teaching and clinical practice were not very well synchronized. However, all the students felt their schools gave them a good undergraduate education and relevant clinical training. Every school had some interesting and useful ideas and practicalities that could be spread to other schools.

Keywords: Undergraduate dental education, curriculum, oral health care provision system, clinical training, patients, treatment needs, interview.

1.0 Introduction

We know that the curriculum structures for undergraduate dental education and the oral health care system are organized differently in Denmark, Italy and Norway (1, 2). Based on this we wanted to look at the similarities and differences in the education of dental students in: Denmark, Aarhus University; Italy, University of Brescia and Norway, University of Tromsø – the Arctic University of Norway, and to see if this creates different preconditions for the students at graduation. We will also give a short description of the oral health care provision systems in these countries.

In present time the universities in Denmark, Italy and Norway are responsible for developing and designing their own curriculum structure for undergraduate dental education themselves. Since there has not been established any united curriculum for undergraduate dental educations, the universities form their own versions based on their own educational principles, strategies, experiences and guidance from the National Ministries of Education. This gives space for diversity and differences in the composition of the curriculums. To reduce the differences The European Commission has several qualitative and quantitative requirements, which they call guidelines, for higher education. Most of these guidelines have been established as a consequence of the Bologna Declaration of 1999 (3). Although the Bologna Declaration introduces the Bachelor-Master-Doctor-model for higher education, there are some specific professions that are regulated by sectorial directives. These directives define, among other things, the minimum requirements for obtaining the degree of that special profession. The European Parliament did approve the Professional Qualifications Directive 2005/36/EC. This Directive includes educational requirements and formal qualifications of practitioners of dentistry (4):

Basic dental training shall comprise a total of at least five years of full-time theoretical and practical study, comprising at least the programme described in Annex V, point 5.3.1 and given in a university, in a higher institute providing training recognised as being of an equivalent level or under the supervision of a university (5).

The two organizations that have played an important role in harmonising and converging the dental education in European Union are the Association for Dental Education in Europe (ADEE) and the DentEd Thematic Network (TNP). The ADEE is an independent European standing organisation, which since 1975 to this day, works for further development of the dentistry's professionalism. The ADEE brings together members from all over Europe with

representatives from dental schools, specialist societies and national associations concerned with dental education. In January 2018 the number of members in ADEE was 157, there among the University of Aarhus, the University of Brescia and the University of Tromsø (4, 6). The DentEd has, among other things, prepared policy documents for competences and core knowledge for the graduating European dentist (3). The purpose of these guidelines, which the universities in the EU follow, is to ensure high quality among the different dental educations in the EU, and establish a greater cooperation between the states in the union (4, 7). One such thing is the establishment of the European Credit Transfer and Accumulation System (ECTS), which is a standard credit system, made to facilitate recognition of periods of study abroad and thereby improve the quality of the students exchange programmes. The ECTS' rules concern information on courses available, agreement between the home and host institutions and the use of credits to indicate the students workload. These rules were meant to reinforce the mutual trust between institutions which offers international exchange programs (4).

2.0 Material and methods

The data used in this empirical study was mainly collected during our exchange program, respectively in Aarhus and Brescia in spring 2017. The information about the curriculums from Aarhus and Tromsø was found at the universities own homepages. Prof. Corrado Paganelli, Dean of the Dental faculty at the University of Brescia, mainly provided the information about the curriculum in Brescia.

During our stay we worked at the universities' student clinics, treated patients ourselves and attended the local lectures. We saw how the students worked and observed which type of clinical cases was most commonly treated. We also observed which groups of patients consulted the student clinics and the patient's need in terms of treatment. We also interviewed students from the 4th and 5th year at the three universities to get their opinions and thoughts about how the dental education is organised at their university (Appendix I). They were asked some practical questions, e.g.: how the education is built up regarding curriculum, preclinical exercises and clinical work; which group of patients are most frequent treated at the clinic and their treatment needs. The students were also asked more subjective questions, e.g. what they think about the curriculum, lectures, clinical work and their supervisors and professors.

3.0 Results

3.1 Denmark and Aarhus

3.1.1 Oral health care system

The population in Denmark is around 5,7 million. In Denmark the oral health care system is divided into a public and a private sector (1). The majority of the adult population have dental treatment in the private sector, paying more or less out of a pocket depending on whether or not they have an insurance including dental care. Children and adolescents up to the age of 18 are provided free dental care, including orthodontics. This is organized by each municipality and can be provided both in the public and the private sector. The municipalities also provide free dental care for elderly who live at nursing homes or institutions and elderly who live at home receiving nursing support. The municipalities give subsidies for dental treatment to those who have suffered from facial trauma and adults with a low income (8). Adult patients with medical diagnosis like Sjögren's syndrome or diseases like cancer can get subsidies for dental treatment in the private sector (1).

There are several insurance schemes offered to the Danish adult population which provide reimbursements when it comes to necessary dental treatment. The most common is the publicly funded "Danske Regioner" or "danmark" which refund, with a variable rate, preventive and basic oral care (1). In addition there are private dental insurances that people buy themselves and in this way complement the public insurance.

3.1.2 Dental education in Denmark and Aarhus

In Denmark dentist are educated at the University of Copenhagen and at the University of Aarhus (1). The Department of Odontology at the University of Aarhus is responsible for the dental education in Aarhus (9). This department offers education of dental students, dental hygienists, clinical assistants, dental technicians and provides research within different sections. The department consists of nine different sections: periodontology, dental pathology (cariology and endodontology), prosthodontics, orofacial pain and bite dysfunctions (gnatology), oral surgery and oral pathology, oral epidemiology and public health, orthodontics, oral radiology and pedodontics (10). The undergraduate dental students receive theoretical and clinical training from each section. The dental education has a duration of five years and is a master degree of 360 ECTS. The theoretical and practical parts of the education are both mandatory, except lectures, and the students are required to participate for at least 80% to get approval (11).

The dental school offers free and discounted public treatment provided by students under supervision and guidance from dental practitioners and specialists (9). The dental education is divided into a three year bachelor degree followed by a two year master degree (12). The students have to get their bachelor approved before they can apply for the master. When they have completed the bachelor they have the rights, within 15 months, to be granted admission to the master degree. This means that the students could take one year of between the bachelor and master degree (13).

3.1.3. Curriculum

The 1st year consists of 7 courses (14) (Appendix II). The course preclinical subjects 1 consist of study-start guiding, dental morphology and toxicology. This course also includes a clinical mentoring, which continues to the 3rd semester, and introduces the student to preclinical work by following an elderly student during patient treatment at the student clinic. Other courses are macroscopic anatomy, dental materials, dental chemistry and biochemistry. At the 2nd semester they have introduction to periodontics and dental pathology (cariology), through preclinical subjects 2, where the students do hands-on exercises with simple cariological and periodontal diagnostic aids.

The 2nd year consists of 11 courses: Preclinical subjects 3 and 4, general physiology, dental chemistry and biochemistry 2, medical genetics, oral histology, studium generale, macroscopic anatomy – prosthetic module, general physiology, microbiology and immunology and pathology. The course studium generale gives the students philosophical, ethical and scientific problems related to dental research, the oral health care system and dental practice. Preclinical subjects 4 consists of dental pathology (cariology and endodontology), oral radiology and the clinical mentoring. During this course the students learn caries diagnostics and treatments, and make composite fillings on phantom models. Macroscopic anatomy – prosthetic module is an anatomy course that requires special insight regarding treatment with removable and fixed prosthodontics.

The 3rd year consists of 11 courses: Clinical subjects FK 5 and 6, anaesthesia and resuscitation, pharmacology, epidemiology and biostatistics, an optional subject, surgery 6, macroscopic anatomy – surgical module, oral radiology and the bachelor project. This year the students start to work at the dental student clinic doing simple dental treatment with guidance from dental supervisor which are authorized dentists or specialists. The course

clinical subjects FK 5 consists of comprehensive dentistry: gnatology, prosthodontics, periodontics, cariology, endodontics, oral radiology, toxicology and psychology. The students get theoretical teaching in diagnostics and treatment planning, preclinical training at the laboratory on phantom models and individual patient treatment at the student clinic. In psychology they have lectures in patient communication and do video recording of own patients in a treatment context. In surgery they focus on treatment principles, surgically reconstructions, complications and medical conditions and diseases. They have an elective course where they can choose between acute medical situations in dental practice and treatment of them or national clinical guidelines for the use of antibiotics in dental practice. On the 3rd year the students write their bachelor project which contains of a written home examination and an oral examination. Two to four students work together with a patient case that has to include cariological, periodontological and prosthodontics diagnosis.

The 4th year consists of ten courses: Clinical subjects 7 and 8, surgery 7 and 8, children and adolescents 7 and 8, clinical oral physiology (gnatology), gerontology, dental pathology and periodontology. The students get more advanced cases e.g. complicated endodontic treatment in several rooted teeth, large composite fillings, periodontal surgery and prosthodontic constructions. Clinical subjects 7 includes comprehensive dentistry: prosthodontics, periodontics, cariology and endodontics. In surgery 7 the students start doing simple surgical treatments on patients under supervision and guidance. They have theoretical and preclinical training on phantom models and surgical treatment on patients, mainly emphasizing on surgical removal of the mandibular third molar, surgical endodontics and extractions of single rooted teeth. Surgery 8 focus on trauma, basic oral implantology, surgical endodontics and extractions. The course children and adolescents 7 introduce the students to orthodontic treatment on children, while clinical oral physiology 7 give the students theoretical and practical training in gnatology. The course clinical subjects 8 consist of comprehensive dentistry: prosthodontics, forensic dentistry, clinical oral physiology and toxicology. The students have to participate a week at the orthopedic section at Aarhus University Hospital observing and assisting surgical treatments.

The 5th year consists of 10 courses: Clinical subjects 9 and 10, surgery 9 and 10, orthodontics, pedodontics and community dentistry, children and adolescents 10, prosthodontics, an optional subject and the master final. Clinical subjects 9 and 10 include comprehensive dentistry, prosthodontics and emergency treatment in dental practice. In Surgery 9 and 10 the

students surgically remove complicated third molars where splitting might be necessary, have complicated extractions and insert single-strand implants. Pedodontics and community dentistry includes lectures, theme days, seminars and clinical practice treating children and adolescents. It is mandatory for the students to stay, twice a year, at a public dental clinic for three to four days doing pediatric dental treatment. They also have a theme day about children abuse and neglect of children care. Before the approval of the master degree the students have to complete the master finale which consists of an oral clinical and written examination, together with a graduate project.

3.1.4. The student clinic and the clinical work

The clinical education is given in the student clinic covered by three sections (dental pathology: cariology and endodontology, periodontology and prosthodontics) and five specialist sections (orofacial pain and bite dysfunction, oral surgery and oral pathology, orthodontics, oral radiology and pedodontics) (12). The undergraduate dental students receive clinical training from each section. The amount of hours at the clinic differs from each year. Which of the sections the students get their practical training at also differ from each year. As mentioned, on the 1st and 2nd year the students participate in assisting and observing elder dental students when they treat patients at the student clinic. At the 3rd year they start with own patients at the student clinic, mainly oral examinations and treatment planning on new patients. During the 3rd year they start making small composite fillings, treat patients with mild/moderate periodontal diseases, root canal treatment on single rooted teeth and make removable partial dentures. The 4th year is the year of prosthodontics. The students are mainly focusing on making crowns and bridges as well as more complicated root canal treatment. This year the students get introduced to the surgical section and get more complicated cases at the student clinic. When the students are in the 5th year they treat patients with more severe dental problems and do even more complicated dental treatment.

At the dental student clinic the students work in separate clinical groups consisting of around ten students mixed from 3rd, 4th and 5th year, having their own dental supervisor. Each student is handed a list of patients who he/she gets the responsibility for and have to treat according to the patients treatment need. The students can also cooperate on the same patient, if it is necessary or if it is a treatment that is not frequently occurred. Although the students are handed their own patients they only do treatment which suits their gradational level. As for example if a patient is in need of a small composite filling they are often handed to the

students in 3rd year. If the patient is in need of prosthodontic work like a crown or a bridge the students in 4th year most often do the treatment. This makes students from different years to co-operate. Another reason making the students co-operate is due to economic constrains at the university during recent years. This has led to a reduced number of available dental chairs at the dental student clinic compared to the number of students, which means that not all the students can treat patients at the same time. The students have to share the dental chairs by following a scheduled list showing who have the main claim of the dental chairs and who have not. The students who do not have a chair can assist other students or do laboratory work, making plaster models and so on.

In the different clinical sections there are qualified dental practitioners, specialists and clinical assistants. The clinical assistants help the undergraduate students during patient treatment when the students need it. Since the Department of Odontology also educates undergraduate clinical assistants the dental students also get help from them during patient treatment in the student clinic.

3.1.5 Patients and their treatment needs

During the exchange period the observations from the student clinic gave the impression that the majority of patients were mainly ordinary paying adults and students. They were normally treated at the student clinic and the treatment needs were mostly caries therapy with composite fillings and endodontic and periodontal treatment. There were not so many patients in need of prosthodontics e.g. crowns, bridges and fixed and removable prosthesis. At the surgical section there were a lot of surgical removals of third molars. These patients were mainly young students and adults. There were also a lot of children at the orthodontic section. From observations, the payment system varied in terms of which treatment the patient had. The students used a scheme with an overview of the treatment costs. They wrote it down on a paper with the signature from their clinical supervisor. The patient then gave it to the receptionist which later would send out a bill to the patient. A lot of the treatment was for free, e.g. the oral examinations, small composite fillings and simple tooth extractions. Surgical removal of wisdom teeth costed 500 DK (67 EUR, 650 NOK) and prosthodontic treatments, larger composite fillings and root canal treatments had also fixed prices. To become a patient at the university dental clinic the patients could contact the clinic themselves and ask to be put on a waiting list for a screening appointment. They could also be referred to

from their own dentist, either to the student clinic or to one of the special sections. When the treatment was provided by a specialist or a dental practitioner the patients had to pay regular fees (9). The student clinic offered emergency care, but only to patients who were currently undergoing treatment at the dental student clinic (9).

3.1.6 Interview of dental students in Aarhus

The dental students from Aarhus interviewed during the exchange period were students in the 4th year. On question of the duration of the education the students were satisfied with five years, but they also felt that the subjects were compressed in a short period of time, making it difficult to deepening in the subjects. By extending the education to six years they thought this could have been improved.

Until further, it is satisfactory with five years. Some subjects might be compromised due to many subjects at the same time. This might have been avoided by extending the education to six years or maybe reordering the structure. It is difficult to say, but it would most probably have been nice with six years as well.

When they were asked if they felt they were theoretically and clinically at the level they should they felt they were. They mentioned that their own effort into learning combined with colloquiums was a big reason for that. They were also very satisfied with the feedback system from their supervisors and teachers. It was new from 2017 that the student would be given, four times a year, a deep evaluation and feedback on their clinical and theoretical work. In comparison to earlier years when they, twice a year, got a short evaluation showing them their subjects rated only with satisfactory, unsatisfactory or unacceptable. The students felt that the new feedback system gave them a good overview, long before the semester was about to finish, of how they lay in the course of education. A typical day for them started with clinical work from 08.00 to 14.00 followed by lectures from 14.30 to 16.00. When they were asked of the number of students studying at each year they said that the number was highest at the 1st year with nearly 80 students. Now they were approximately 55, which they thought was good. The reason why so many quitted, were because of the anatomy and physiology examination in the 1st and 2nd years, when around 20 % of the students failed. The lack of interest and students wanting to study medicine instead made the number reduce as well. The students interviewed were satisfied with the introduction to the different preclinical and clinical work. When they started treating own patients they felt ready and eager to start. They also felt that the preclinical and clinical parts corresponded with the lectures. In respond to the question if

the education could focus more on something they mentioned that during the 2nd year it would have been nice to observe at the different specialist sections for a whole week. The clinical mentoring only covered the student clinic and not e.g. the surgical and gnatology section. In this way they would get a better understanding in what the sections offered the patients in types of treatment. On question about the dental supervisors and professors regarding helping and guiding the students, they were satisfied with the clinical part, but in the theoretical part, the professors' educational skills varied. The students were satisfied with the administration. When it comes to interdisciplinary teaching with other professions the students said that they had co-operative clinic during the 7th and 8th semester, where they had patients together with undergraduate dental hygienists, clinical assistants and dental technicians. This was still only a pilot project and the students thought that the idea behind was good, but that the practical implementation did not work fully as it should. The students said the dental school was a nice place to be and the atmosphere was good. There was an internal competition among students, but everyone helped each other theoretically and practically and often gathered at social events outside of the school (15).

3.2 Italy and Brescia

3.2.1 Oral health care system

The population in Italy is around 60 million. In Italy the government-funded primary care in line with Legislation on Essential levels of Care (LEA) is only provided by the public dental service. Essential levels of care are a political definition that is made to determine which health care services that are essential and to limit health expenditure for these special services for the population. The LEA system forms a benefit package, on national level, that is guaranteed free of charge or with a reduced fee for those who can afford it. The LEA includes oral health care to: children 0-14 years old, vulnerable persons (medically compromised and those with low income), pregnant women and individuals with urgent/emergency dental problems. It is also provided dental examinations in order to ensure early diagnosis of neoplasms in the oral cavity for all citizens, residents and EU visitors. Regions may also fund additional services that are not listed in the LEA system, but must finance these themselves. The remaining population that is not covered by the LEA system pays for the dental services out-of-pocket, and therefore dental care is mainly provided by the private sector (2).

3.2.2 Dental education in Italy and Brescia

In Italy there are 35 universities that have a dental faculty, two of them private. The remaining 33 universities are public and therefore the universities' dental clinics are too. These clinics provide dental care services in line with the LEA system together with approximately 340 other public dental clinics all around the country. Each year approximately 480.000 consultations and treatment are provided by the universities dental clinics all around Italy, along with 21.000 day-case hospital admissions and 3.000 long-term hospital admissions. There are approximately 370 university dentists working at these hospital clinics. The number of new students in 1st class per year per school was on average 20 students with a range of 10-60 students in the academic year 2016-2017. In comparison to dental schools in other EU member states this number is low (2). Before 1980 there was no specific dental education in Italy and the dental practitioners where graduating as medical doctors. The law for practising dentistry changed in 1980 and as a result medicine and dentistry were separated into two different educations. Medical doctors graduating after 1980 who did not have automatic right to practice dentistry could, in the past, attend postgraduate courses to be enable to be licensed as dentists (8). The students graduating today have to graduate in dentistry to get the license as dentists, but since the older generation of dentists do not have this education there are today three ways to legally practice dentistry:

1. Graduates in Dentistry
2. Graduates in Medicine and Surgery enrolled in a university course before January 28th 1980, with or without a specialisation in Dentistry
3. Graduates in Medicine and Surgery enrolled in the university course after 28th January 1980, holding the diploma of specialisation in dentistry or authorised to practice dentistry according to D. lgs. 386/98 (16).

Today the dental education in Italy is an integrated master degree and has a duration of six years. The dental education at the University of Brescia is no exception. The Italian universities use CFU (Credito Formative Univeritario), which is a credit system that is equivalent to ECTS. One CFU corresponds to 25 hours workload. This workload reflects the time an average student has to study to obtain the required learning outcomes and it consists of lectures, seminars, internship, self-study, preclinical and/or clinical activities, etc. (17). The dental students in Brescia are required to earn at least 360 CFU to graduate as a dentist. 90 of these CFU's consist of preclinical and/or clinical activities, whereas the remaining 270 CFU include other activities like: lectures; master thesis preparation and discussion; and optional courses (8 CFU). When it comes to the optional courses the students may ask for alternative

topics, but these have to be approved by the Consiglio di Corso di Studio – the Faculty Council – which consists of student representatives and all teachers involved in the courses during the entire six years, chaired by the Dean of the Dental Faculty (18). The first two years consist of theory and it is not before the third year the students get practical and clinical training. Gradually the students do more clinical work and become more independent in their work. The theoretical and practical parts of the education are both mandatory for at least 85% of the total number of hours (19).

3.2.3 Curriculum

The following section will concentrate on the theoretical part of the curriculum (Appendix III). The 1st year the students have lectures in general medicine subjects: psychology, chemistry, physics, biology, histology, genetic and statistics. They also have more specific odontological subjects like anatomy and radiology of the head and neck, oral anatomy and neuroanatomy. This year they have one course in English language.

During the 2nd year the subjects taught are biochemistry, physiology, general and clinical microbiology, hygiene and infection control, general pathology, research methods, epidemiology in dentistry, preventive dentistry, dental biomaterials and pre-clinical subjects.

During the 3rd year the students do preclinical exercises at the simulation clinic. After passing the preclinical examination the students can treat patients at the dental student clinic. The main subjects lectured this year are cardiovascular diseases, infections, internal and acute medicine, bioethics, dental biomaterials, laboratory work, anaesthesiology, endodontology, conservative dentistry (cariology), oral pathology, histopathology of infections and neoplasm, pedodontology, pharmacology and diagnostics with general x-ray images and special images.

The 4th year the students have lectures in anaesthesiology and emergency treatment, general and oral surgery, neurology, psychology, special pathology, dermatology, fixed prosthodontics, periodontology, orthodontology, conservative dentistry (cariology) and gnathology.

The 5th year the students have more detailed lectures in endodontology, conservative dentistry (cariology), periodontology, oral surgery, fixed prosthodontics, orthodontology and

pedodontology. They are introduced to maxillofacial surgery and removable prosthodontics. The final examinations are written at the end of the 5th year.

During the 6th year the students are mainly working with their master thesis. Since the final examinations were written in the 5th year, the 6th year students have few lectures in prosthodontics, periodontology, orthodontology, pedodontology, oral surgery, conservative dentistry (cariology) and endodontology.

3.2.4 The student clinic and the clinical work

Brescia is a city in the region Lombardy in the northern part of Italy. It is the second largest city, after Milano, in the region and the seat for the Università degli Studi di Brescia. The dental student clinic is located right across the city hospital, which makes it easy for hospital patients to go to the dental clinic and have the treatment they need. The dental student clinic consists of different sections: prosthodontics, periodontics, emergency room, pedodontics, orthodontics, oral surgery, conservative dentistry and endodontics. Each section has two to four dental chairs. Since there are few dental chairs at each section the number of patients treated every day is limited. It is important to emphasize that almost every patients are treated by at least one operator and one assistant, both of them usually students. The supervisors do some of the more complicated treatment. The elderly students or the supervisors usually approve the treatment provided by students who are less experienced. After patient treatment the working station are cleaned and sterilized by dental assistants. Meanwhile the students fill out the payment scheme to the patient and write the paper journal of the treatment that has been provided.

The students are, from the 3rd to the 6th year, divided into groups within their classes. Each group stays at different clinical sections for one month at a time. The students treat patients for four hours in the morning every day. If the students do not have any lectures after lunch they normally treat patients for a couple of hours in the afternoon as well. The duration of every patient treatment is normally one hour. The students have certain days they spend at the clinic. The 3rd year students are only at the clinic on day a week and they are mostly observing or assisting the students from the 5th or 6th year. They do examinations and make small composite restorations with guidance from the 5th or 6th year students. The 4th year students are at the clinic three days a week and they are allowed to do more complicated treatment like difficult composite filling, more advanced surgery or simple root canal

treatment. The students from the 5th year are working at the clinic four-five days a week. These, together with the 6th year students are the ones that do the most complicated treatment. This includes, among other things, difficult composite fillings, advanced surgery and root canal treatment. They often mentor and guide the younger students, together with the supervisors. Since the 6th year students are working with their master thesis they have less clinic than the 5th year students. The students have the possibility to apply for a three month exchange period in another dental faculty in another country and if the application is approved the student can do some of the final clinical work at that university. During the three last years of the education the students are one day a week at a special section of their own choice. This choice corresponds with their subject for their master thesis. For example a student that is writing a master thesis about endodontics will spend one day a week at the endodontic section. At the dental clinic in Brescia there is an emergency room (ER) for patients with acute problems. The ER is open 24 hours a day, and the dental students have to work shifts at the ER during their education, either day or night. It is always supposed to be one student from the 3rd, the 4th and the 5th year, together with a supervisor, on the ER. In case of quiet periods during the night shift the students and the supervisor have the opportunity to sleep.

3.2.5 Patients and their treatment needs

From personal observations done at the dental student clinic in Brescia and statements from students interviewed in Brescia the students mainly treat patients that are physically or mentally compromised, who often have a big treatment need. Examples are HIV positive patients, patients with osteoporosis, patients that have had a stroke or that have undergone cancer treatment, elderly patients with reduced mobility that compromise dental hygiene, patients with Downs syndrome, autism, etc. There are also some patients with low income that have their treatment covered by LEA. In the orthodontic and pedodontic section the percentage of healthy patients – both physically and mentally – are greater compared with patients treated in other sections, but most of these patients are also compromised in some way or another.

It is often post-cancer or post-surgery patients or patients with osteoporosis. Approximately 50% of the children have some kind of illness. In orthodontics the type of patients depends of which kind of treatment need they have, but they are often generally or orally compromised.

The patients on the student clinic do normally not pay for the treatment because the LEA covers them. There are some few exceptions from this where the patients pay a reduced fee.

In cases where the patients gets prosthodontics appliance, fixed or removable, the patients have to pay for the laboratory technician expenses, but not for the clinical treatment done by the students. According to the students interviewed and personal observation the most frequent treatment done at the dental clinic is extractions and fillings, together with emergency treatment in the ER. Root canal treatment and periodontal scaling are more seldom. Prosthodontics treatment is also provided, but more seldom since the patients have to pay for the laboratory technician expenses themselves.

3.2.6 Interview of dental students in Brescia

The interviewed dental students in Brescia were in their 5th year. Most of the students think the duration of the education is too long and should be 5 years instead of 6 years. Overall they are satisfied with their own knowledge so far, but think they should learn more, both theoretically and in clinical practice, in some subjects, especially in prosthodontics, orthodontics and gnathology. On one question we asked the students what they have done to acquire the knowledge and experience that is expected of them and one student said: “Going the extra mile. Meet up at the afternoon and contribute with more than is expected”. We also asked the students how a typical day at the university looks like. The student said they are at the clinic between 08.30 and 08.45 to prepare themselves on patients of the day. They have patients from 09.00 until 13.00, sometimes longer because of delays. The lunch is from 13.00 to 14.00 and from 14.00 to 16.30 the students have either lectures or treat their own patients. The own patients are normally cases that the students could use in their master thesis or cases that allow the student to get more clinical experience in that special subject. The students said that there are around 20 students or less in every class and they think this is a nice number. If the number of students were much less than 20, the amount of clinical work per student would be excessive and demanding. On question about dropouts the average is one dropout per year. The students are generally satisfied with how and when the clinical work is introduced. One student put it quite nicely: “It is a good thing because when you first start to use your hands you do not want to read anymore”. Another student said that it was good to begin the clinical work at the 3rd year because the first two years are needed to study general medicine. On questions about how the lectures and the clinic correspond to each other the student said they generally do not correspond very well. Sometimes the subjects are lectured before the clinic, but it is also quite normal the other way around. The students think the lectures could have been of a higher quality. The lectures are, according to the students, a monolog with little discussion and in a lot of cases the professors are talking about other things than they are

supposed to. It was also mentioned that the time interval between one lecture to the next, in the same subject, is too long, which makes it difficult for the students to get a greater and more comprehensive understanding of the different subjects. The communication between the professors could also be better according to the students. Some of the students said there are not enough of clinical supervisors and that they would like more supervision and guidance, together with the possibility to spend more time on each patient appointment. The students think they have enough patients during their education to get the clinical experience needed to work as dentists. Nevertheless they express lack of clinical experience in orthodontics and prosthodontics. On questions about benefits with the dental education in Brescia the students said they are pleased with the great amount of clinical work and tell that they have more clinical experience than a lot of other dental students in Italy. This is also one factor that is mentioned to make a big difference when the students are applying for job after graduation.

3.3 Norway and Tromsø

3.3.1 Oral health care system

The population in Norway is around 5,2 million. In Norway the oral health care is provided by a public and a private sector. The majority of dentists work in the private sector and treat mainly adult patients who pay for the treatment themselves. The public sector treats groups listed from A to E in prioritized order. Group A patients are children and adolescents up to the year they reach 18 years. Group B patients are psychologically disabled people who live at home or at an institution. Group C patients are elderly, long-term ill and disabled who live in an institution or have home nursing. Group D patients are young people who are 19 to 20 years of age in the year of treatment. Group E is the last one and can vary in types of clientele. Each municipality decides who belongs to group E and it can be people with substance abuse issues, refugees or prison inmates. All these groups get necessary dental treatment for free, except group D which has to pay a low fee. In addition to the prioritized groups the public sector can treat adult paying clientele (1, 20).

In Norway there is a national insurance scheme that reimburses necessary dental treatment for adults who have certain medical conditions or rare diseases. The dentist have to decide if the adult patient have right to get reimbursed (1). HELFO (The Norwegian Health Economics Administration), which is a part of the National Directorate of Health, reimburses the costs.

3.3.2 Dental education in Norway and Tromsø

The dental education in Norway is provided at three different universities: in Oslo, Bergen and Tromsø. In Tromsø UiT – The Arctic University of Norway, Department of Clinical Dentistry (IKO), under the Faculty of Health Sciences educates undergraduate dental students, dental hygienists, dental specialists and PhD candidates. The Department consist of two separate, but cooperative departments, the Dental Health Center of Northern Norway (TkNN) and the University Clinic (UTK). The dental university clinic is a publicly funded clinic where the undergraduate dental students get clinical training. The majority of the clientele are adult patients paying out-of-pocket. There is also a lot of group A patients (children and adolescents) and adult patients who are entitled to receive support from HELFO and get reimbursed dental treatment. The duration of the dental education is 5 years and the students accomplish 300 ECTS at the end of the education. It is possible to take a year off to do research studies, which will make it a 6 years long education. The curriculum at the dental education in Tromsø was last time approved in 2012 by the Faculty Board of the Faculty of Health Sciences (21). The revised version of the curriculum was made due to the quality reform for higher education, which the Parliament presented in 2001. The quality reform demands requirements for curriculums described in the “Regulations on standards and criteria for accreditation of studies and criteria for accreditation of institutions in higher education in Norway”, January the 25th 2006; “Profile and Competences for the European Dentist – update 2009”; “Appendix 1 Profile and competences for the Europaen Dentist – update 2009”; and “Gjør din plikt - krev din rett”, St.meld. nr. 27 2000-2001 (21).

The Department of medical biology (IBM), together with the Department of Clinical Dentistry (IKO), the Department of Community Medicine (ISM) and the Department of Clinical Medicine (IKM) are responsible for the first year of the dental education and half of the second year. The dental students and the medicine students are one gathered class during the first two and a half years. From the third year IKO has the main responsibility regarding the education, and focus now on clinical odontology.

3.3.3 Curriculum

During the 1st year the dental students in Tromsø have their lectures, seminars and other activities together with the first year medical students. They are one gathered class and have lectures in general medical subjects which consist of basic human functions, general anatomy and histology of the human body. They also have courses in chemistry, biochemistry, human

digestion and metabolism system, anatomy, histology and physiology of the heart, lung and kidneys, cell biology, cell proliferation and cancer, genetics, inflammation and infection. The students have lectures in statistics and teach how to write and read academic articles and papers and have lectures and seminars in philosophy, ethics and human autonomy. In the philosophy course students get divided into small groups, where they discuss and work on different topics. The dental and medicine students have interdisciplinary courses with other students e.g. undergraduate physiotherapists, bioengineers, radiographers and nurses, discussing interdisciplinary co-operation in the health sector. The 1st year the dental students have observation days at the dental student clinic whereas the medical students observe at the University hospital. Beside the lectures the students have a lot of mandatory laboratory and histological exercises.

The first two months of the 2nd year the dental students have lectures together with the medical students. These lectures are in statistics, epidemiology, preventive medicine, evidence based science, reproduction, embryo and genetics. After the second month the dental and medical students are separated and the dental students have lectures in microbiology, infections, infection control, the locomotor system, pathology, human anatomy, physiology, pharmacology, biochemistry, neurology, endocrinology, digestion, immunology, histology, anatomy of head and neck, oral microanatomy, oral histology and tooth morphology.

At the 5th semester the students are introduced to clinical work with preclinical exercises. These exercises consist of cavity and crown preparation, together with periodontal supra- and subgingival scaling, and are done on plastic teeth on phantom models. At the same time the students have lectures in oral pathology, radiology, pedodontology, orthodontology, fixed prosthodontics, dental biomaterials, oral microbiology, oral ecology, pharmacology, toxicology. At the 6th semester the students begin at the dental student clinic treating their own patients. The students have lectures in radiology, pedodontology, orthodontology, anaesthesiology, oral surgery, oral medicine, periodontology, cariology, endodontology, gerontology, community dentistry, prosthodontics and gnathology.

On the 4th year the students are getting more clinical experience. They are mainly at the clinic treating patients. The subjects lectured are radiology, oral pathology, neoplasm and cysts in the oral cavity, pedodontology, orthodontology, endodontology, periodontology, cariology, fixed- and removable prosthodontics.

On the 5th year the students are supposed to treat patients with more complicated treatment needs. They are writing their individual master thesis and are studying for their final examinations. The final examinations cover all clinical subjects thought from the 3rd to the 5th year: pedodontology, orthodontology, endodontology, prosthodontics, gnatology, cariology, gerontology, oral surgery, oral medicine and periodontology. The thesis has to be delivered in May and the students have to defend their thesis at the end of the 10th semester.

3.3.4 The student clinic and the clinical work

The student clinic in Tromsø is a fairly big and new clinic with a lot of dental chairs and therefore has the capacity to treat many patients at the same time. It consists of mainly one big clinic area with 53 dental chairs and nine smaller rooms for special dental treatment like endodontic, periodontic and pedodontic treatment. These rooms have one dental chair each. The students are divided into groups of around six students. Every group has one supervisor and one dental assistant. During examinations and treatment of patients the supervisor has to approve several steps during the whole dental procedure. The number of steps depends on which type of treatment that is done. Simple treatment does not need as many checkpoints as complicated procedures. The students have to fill in the payment information on the computer and write the journal in an electronic journal system. The supervisor must also approve this journal. The students are mainly working without assistance with some exceptions, and have to clean up and sterilize their working station after themselves. At the 6th semester during the 3rd year the students begin with their first own patients. The treatment done is mainly examinations, periodontal supragingival scaling, extractions of upper wisdom teeth, excavation of caries and making of small, non-complicated composite fillings.

In the 7th semester the students work at a public dental clinic in Norway due to “External clinic I”. They work as regular dentists, with some restrictions, by guidance from a supervisor working at the clinic (22). The goal is that the students get practical skills and becomes more confident doing examinations, supra- and subgingival scaling, excavation of caries and making more complicated composite fillings. The students should also get the opportunity to do single crowns, root canal treatment in single rooted teeth and more complicated extractions. At the 8th semester the students are back at the dental student clinic in Tromsø and are supposed to get patients with more complicated treatment needs when it comes to restorative treatment, surgery and root canal treatment. The students have to do examinations

and treat more children than before, both from a pedodontic and from an orthodontic point of view.

In the 5th year the students are supposed to treat patients with further complicated treatment needs by working at the dental student clinic in Tromsø during the 9th semester and in the beginning of the 10th semester. The students are treating mainly adult paying patients, as well as children from a pedodontic and from an orthodontic point of view. During the 10th semester the students have “External clinic II” and are, once again, working at a public dental clinic in Norway. This time the external clinic period is for two months and the treatments are more complicated level. They still get guidance from a supervisor working at the clinic.

3.3.4 Patients and their treatment needs

The patients treated at the dental student clinic are mostly healthy adult patients who pay out-of-pocket. Some of the patients are healthy children, some are elderly, some are physical/physical compromised. The most frequent treatment done at the dental student clinic is examinations, hygiene motivation and professional prophylaxis, composite fillings, extractions and periodontal treatment as supragingival and subgingival scaling. It is also made prosthodontic constructions, mostly single crowns, and root canal treatment, but these treatments are less frequent. At the external clinics the treatment needs could differ from one to another. One reason for this could be the uneven number of clinics through different geographic areas. This means that in areas where there are only one clinic, and miles apart to the next one, the potential of getting patients with a greater and more advanced treatment need is higher compared to geographical areas where several clinics and specialized dental practitioners work. In this way, clinical work in the districts could offer more prosthodontic constructions, root canal treatments, extractions, fillings and periodontal therapy.

3.3.5 Interview of dental students in Tromsø

The students interviewed were at their 5th year. They said the duration of the education is enough and were satisfied with their theoretical knowledge and clinical experience. They mentioned that their own effort into self-study and the great amount of clinical work during the education was the reason to that. A typical consisted of clinic and/or lectures from 08-16, often followed by some hours self-study. The students were satisfied with the numbers of students in every class, which normally varied from 40 to 30. They felt that a low number was beneficial since each student would get more guidance from the dental supervisors. The

dropout is quite high the first year. It could be due to opportunity dental students have to convert to medicine after the first year, since the curriculums are identical. The fact that the dental students have the same lectures and examinations as the medical students the first year, the dental students are feeling confused not feeling like a dental student at all could, also be a contributing factor. Since dental students educated abroad could convert to the dental education in Tromsø, during 3rd year, the overall dropout is reduced. On questions about the preclinical activities and the clinical work the students said that the preclinical activities came a little too late and that it could be introduced earlier. The clinical work could also have been introduced earlier, but only if the preclinical activities were done in advanced. The students do not think that the lectures and the clinic correspond very well. Sometimes the subjects are lectured long before the students are introduced to the corresponding clinical part, but often it is the other way around. One of the reasons for this is the spiral learning approach. The students think especially that some lectures in specific courses were outdated and that different subjects tend to be lectured to many times. "The lectures in some courses are very theoretical. Some of the professors have not been working as clinical dentists for many years, some of them are of course skilled but some have lost the clinical approach". On question about if it is something that should have been focused more on one student said that it should have been lectured more about esthetical treatment like onlays, veneers, bleaching and its ethical perspectives. One student said that a more practical approach to periodontics would have been beneficial.

The students were satisfied with the help and guidance from the clinical supervisors and the professors, but that the communication between the supervisors and the professors should improve and that it should be a united agreement in what the students are supposed to be taught both theoretically and clinically. The students are in general satisfied with their clinical supervisors and say that most of them are very scholastic, skilled dental practitioners wanting to help the students, but that there are also some less engaged and skilled ones. One student mentioned that the differences in the field of dental practice is also to be seen among the clinical supervisors at the dental student clinic, when it comes to what each supervisor would choose to do in terms of treatment. This could be both beneficial but also confusing. When it comes to the administrative part the students are not satisfied. A lot of the information given from the administration can come in a short notice or even not given at all. The students therefore encourage the administration to take initiative and schedule more time to inform the students in a more gathered form. On question if they have interdisciplinary teaching with

other professions the students say yes. And the respond is two folded. One student thinks it is good and would like to have more of it. One argument for this was that since the health care system is interdisciplinary, it is also beneficial to work interdisciplinary during the education, especially the co-operation with the physiotherapists. Another student thought it seemed like a good idea theoretically but that the practical implementation did not work. The students interviewed are satisfied with this arrangement of a fixed curriculum, not being able to elective themes themselves. They mentioned that it is important to get an good overall knowledge before specializing and that the students should have the same knowledge when they graduate. When asked about which kind of patients consulting the dental student clinic the students said that it varied, but a majority of students, some elderly, children and adults. They think that the reduced fees are a huge reason to why so many consulted the dental student clinic. The treatment needs are mostly caries, periodontal and prosthodontic treatment. There are a lack of patients in need of endodontic treatment and severe, deep caries. When the students are asked if they fulfil required treatments each semester the students say that most often manage to do so, but because of lack of patients in some specific treatments it varies. Some students get a lot of one specific treatment while others do not get anything at all. One student mentioned that the more seldom treatments could be distributed better by the supervisors. The students are both very satisfied with the amount of clinical practice during their education and the external clinic periods on the 4th year and 5th year.

To question about what can be improved the students mention that there should be an earlier introduction to dental subjects and the education should have a more odontological approach from early on. It was also mentored that the number of dental supervisors could be increased or the number of new incoming dental students lowered to reduce making the students use less time waiting for supervision and more time on patient treatment. They also would like to have a better correlation between lectures and clinical work. On question of how the work opportunity is after graduation the students think it is good. It is not as easy as before getting a job, but if they are willing to move they think it will not be any problem.

4.0 Discussion

While writing this thesis we did contact, the Norwegian Directorate of Health, Authorisation and License of Health Personnel (SAFH) to get information about the possibilities dentists educated abroad, especially those educated in Denmark or Italy, have to get Norwegian dental

authorisation. SAFH referred to the regulation “Forskrift om autorisasjon, lisens og spesialistgodkjenning for helsepersonell med yrkeskvalifikasjoner fra andre EØS-land eller fra Sveits” and the appendix “Vedlegg II til forskrift om autorisasjon, lisens og spesialistgodkjenning for helsepersonell med yrkeskvalifikasjoner fra andre EØS-land”. This Appendix is based on the “Directive 2005/36/EF” and “(EU) 2016/790” (23). These documents say, among other things, that if a person is licensed as a dentist in either Denmark or Italy, and can submit certificates that prove this, he/she can apply for Norwegian authorisation and get the appliance granted. This implies that the applicant has the sufficient language knowledge. According to the EU Directive the Norwegian dentists can also be authorized to work in Denmark or Italy, or any other EU/EEA member state.

4.1 Oral health care system

The oral health care system in Denmark and Norway are organized quite similar to one another. Both countries have a private sector and a public sector. The majority of the adult population get dental treatment from the private sector, paying out-of-pocket. In Denmark however, there are both publicly funded and private insurance schemes that give all adults reimbursements to necessary dental treatment. In Norway there are no such insurance schemes, but on the other hand HELFO (The Norwegian Health Economics Administration) gives reimbursement due to certain medical conditions or diseases. All children in Denmark and Norway, up to the age of 18 years, and children in Italy, up to the age of 14 years, have free dental treatment. In Norway the children get the treatment from the public sector and in Denmark the services can both be provided by the public and private sector. In both Denmark and Norway, elderly living at home receiving nursing support or living at an institution have free dental care. In Italy the LEA (Legislation on Essential levels of Care) covers pregnant woman and adults who are physically and mentally vulnerable or have a low income. The treatment of these patient groups is either free or the patients have to pay a reduced fee. In this way the oral health care system in the three countries have certain similarities when it comes to helping the vulnerable part of the population. In addition to this all citizens in Italy can have emergency treatment for free in the public sector.

4.2 Universities and dental education

All three universities are obligated to have a credit and grade system, which is comparable to the European Credit Transfer and Accumulation System. They all have such credit and grade

system and therefore, when the students graduate, the minimum requirements regarding workload are fulfilled. One difference in the amount of ECTS at the three universities is that in Brescia the duration of the education is 6 years and the students therefore get 360 ECTS instead of 300 ECTS, like the students get in Aarhus and Tromsø in 5 years.

4.2 Curriculum

Although the different subjects taught during the whole education in Aarhus, Brescia and Tromsø are more or less the same, there are some differences in when these subjects are taught. The dental education in Aarhus starts with an odontological approach, both theoretically and practically, already from the 1st year, in comparison to the dental educations in Brescia and Tromsø. In these universities there is a more theoretical and general medical approach the first one and a half years. A reason for this could be that the dental and medical students in Tromsø are one gathered class the first two and a half years and fact that the dental students in Italy were studying medicine, and not dentistry, before 1980 can have given the dental education in Brescia a more medical approach. From the end of the 2nd year both educations in Brescia and Tromsø get a more odontological approach and curriculums at the three universities get more similar to each other.

We think that the dental education in Aarhus, with its early introduction to the odontological aspects is highly beneficial for the students. One of the reasons for this is that the students get a feeling of studying dentistry already from the first year and get an insight in what a dentist do on a daily basis. This is also beneficial for the students who are uncertain on the choice of education, since the students usually drop out during the two first years. One part of the dental education in Aarhus the students were satisfied with was the amount of thorough evaluation and feedback. The students felt that the new feedback system gave them a good overview, long before the semester was about to finish, of how they lay in the course of education. This is especially beneficial for students that are at risk of not passing the semester.

We think it is beneficial for the students in Brescia to have “students own choice” in a subject corresponding to their master thesis. This could make the clinical work more interesting for the students. In another way some of the students in Brescia that were interviewed said that unless the students write about prosthodontics or orthodontics in their thesis they do not learn much about these subjects, nor see a lot of patients with these treatment needs. One student

said: “I like this system, but if you do not write about prosthodontics or orthodontics you get little experience about these topics. One advantage is that you get more experience from another subject“. The overall impression is that the students in Brescia are satisfied with the possibility to get more clinical experience in the subject of their thesis. This could be something the dental educations in Aarhus and Tromsø could learn from. When we asked the dental students in Tromsø the response was two-folded; one student think it is beneficial with a fixed curriculum whereas one is more open to the opportunity to specialize as long as it does not compromise the knowledge in other subjects. As the dental student interviewed in Brescia said, the knowledge of other subjects could be compromised, which is one of the reasons why we are not sure if the optional subject is something that raise the quality of the dental education or not.

The fact that the subjects taught at these three universities are more or less the same, but with some different approaches, makes it reasonable to understand why a dentist educated in Denmark, Italy or Norwegian could work as a dentist in an EU/EEA member state. This corresponds to the EU Directives intentions.

4.3 The student clinics and the clinical work

All three universities have their own individual way of organizing the clinical work at the dental student clinic. In both Aarhus and Tromsø the students have their own patients. In Aarhus it is common to exchange patients with other students when certain treatment measures are needed, while the students in Tromsø as a standard provide all treatment measures the patients need. The students in Aarhus and Tromsø follow the patients until all the different diagnosed treatment needs are completely treated. In this way the students follow the patients over a longer period of time. We think this is good because it simulates how it is in real life. It is also educational for the students to see for themselves how the treatment they have done, and the quality of it, effect the patients oral hygiene and oral health over time. At the dental student clinic in Brescia the students have a different system compared to Aarhus and Tromsø. The students are at one section for one month before they move to next section. One positive outcome of this is that the students does one type of treatment every day for a month and in this way they have continuous training at every section. The students in Brescia have a few patients that they follow over a longer period of time, but most often they treat patients they have not treated before. One consequence of this is that the students do not

usually get to see the result of their own treatment over time and do follow-ups, compared to the students in Aarhus and Tromsø. In another way it should be emphasised that it is educational to communicate to different and “new” patients, which the student in Brescia do every day.

Since the dental students in Brescia work together with at least one other student on almost every patient treatment, the students learn to cooperate with each other early in the education and get the opportunity to learn different treatment methods from each other. The dental students in Aarhus also have a lot of co-operation, either by assisting each other or by sharing the same patient. This is different from Tromsø where the students seldom share or work together with other students and most often work without assistance. This can be beneficial for the dental students in Tromsø since they most likely get more independent in their clinical work, learning to do treatment without assistance, compared to the students from Aarhus and Brescia. One negative outcome of this is that the result of the dental treatment could be jeopardized, especially during difficult treatment, because these often require assistance. It should also be mentioned that educated dental assistants should perform the cleaning and disinfection done between each patient. In this way the infection control and prevention is well executed, also in situations where the students are behind schedule.

One of the special characteristics of the dental education in Tromsø is the two periods of external clinic, where the students work at different public dental clinics in different parts of Norway. The external clinic is known to be very educational for the students and the overall impression from our co-students are that this is the best part of the education. We think it is a good arena to learn how to work as a dentist since it simulates how it is in real life. The way it is organized makes the students work and treat patients like any ordinary dental practitioner would. This gives the students experience and knowledge of how it is to work as a dentist, and this, long before they graduate. The supervisors at the external clinics have fewer students to supervise compared to the supervisors at the dental student clinic in Tromsø. In this way the students have more time to treat patients, because of reduced waiting time. We think the students get more independent and confident during the external clinic periods. The patient clientele and their treatment needs differ between the external clinics. Some clinics treat mostly children with little treatment needs, whereas others treat mostly adults with more severe treatment needs. This could lead to that the students acquired experience differs which can be a disadvantage with the external clinic. We do not think this is a long-term problem

because this will in most of the cases even out during the education, especially in the final semester. The students interviewed in Tromsø said that they are satisfied with the external clinic periods and think that is the reason why they are getting the clinical experience that is needed to be a dentist. Also in Aarhus and Brescia the students interviewed think they have enough clinical experience. The students from Brescia and Tromsø feel they have more clinical experience than dental students from other dental educations in Italy and Norway, and that this could make it easier to get a job after graduation.

We think the dental education in Brescia is well executed when it comes to the amount of clinical work. One reason for this is that the students have one extra year of clinical practice compared to the students in Aarhus and Tromsø, which we think is beneficial. We also think it is educational for the students to assist each other. This way they could exchange knowledge regarding clinical diagnosis and methods of treatment.

4.4 Patients and their treatment needs

When it comes to comparison of the patients treated at the dental student clinic in Aarhus and Tromsø the clientele is almost the same, most frequently students and adults paying out-of-pocket, which usually consult the clinic because of the reduced fee. At the special section of orthodontics and pedodontics in Aarhus the patients are children getting the treatment for free, the same way as in Tromsø. There is a lack of patients in need of full dentures both in Aarhus and Tromsø. In Tromsø there is especially difficult to find patients in need of endodontic treatment. This was neither a huge patient group in Aarhus, but not as few as in Tromsø. The patients in Aarhus and Tromsø are most frequently generally healthy, both physically and mentally, compared to the patients in Brescia, which often are both generally and orally compromised. Two exceptions are the orthodontic and the pedodontic section in Brescia where generally healthy patients are more often treated than in the other sections. The most frequent treatment in Brescia is extractions and composite fillings together with emergency treatment. Endodontic treatment is also done, but more seldom, and from own observations it seems like a lot of the patients who had appointments in the endodontic section did not meet to these appointments. Patients who got prosthodontic treatment were neither usual, most likely due to the laboratory fee the patients had to pay for themselves.

4.5 Conclusions

The aim of this master thesis was to compare dental educations at Aarhus University in Denmark, at the University of Brescia in Italy and at the University of Tromsø – the Arctic University of Norway. We found many similarities and differences. One can conclude that there are a lot of ways to educate undergraduate dental students, both theoretically and practically, and that it is difficult to decide if one way of educating is better than another one. It is obvious that all three educations fulfill the EU regulations as regards contents and the length of the studies. In general, all universities have the potential to improve the educations they offer regarding educational structure and curriculum. The dental education in Aarhus, Brescia and Tromsø are no exception.

We think that a combination of the previously mentioned parts, which we think is of high educational quality in the different educations, would give an even better dental education than these three universities offers today, and that this could be of interest for the universities.

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6.0 Appendix

6.1 Appendix I – Interview questions

1. How long is the dental study in the university you study at? Do you think this is too much/perfect/too little?
2. How many years have you studied dentistry?
3. Do you think you have enough experience regarding the number of years you have study? If yes, what have you done to accomplish it? If no, what have you done to not accomplish it?
4. How does a typical day on the university look like?
5. How many students are you in every class? Do you think the classes are to big/perfect/to small?
6. How is the dropout during the study?

Preclinic, clinic, lectures

7. Which year do you start with preclinic/simulationclinic? Do you think this is to early/perfect/too late?
8. Which year do you start with clinic? Do you think this is to early/perfect/too late?
9. What are lectures about in the different years?
10. Do you think the lectures and the clinic correspond with each other?
11. Is it something that should be focused more on?
12. Is it something that should be focused less on?
13. How much help do you get from the supervisors/doctors/professors during the study (especially in the preclinic and clinic)?
14. Do you think everything work as it should do during the study (considering lectures/theory, preclinic, clinic, supervision from the supervisors/doctors/professors, exams, etc.)?
15. What do you think about the lecturers?
16. What do you think about the supervisors/doctors in the clinic?
17. What do you think about the administration?
18. Do you have lectures with other professions? If yes; what is the topic of these lectures, what do you think about the shared lectures, do you get something out of these?

Curriculum and exams

19. Do they change the curriculum often?
20. When it was last changed?
21. Does the study have a fixed curriculum or do you have a possibility to choose one topic to specialize in? If it is possible to specialize; how do this work and what you think about it (benefits/disadvantage)? If it isn't possible to specialize; do you know why this isn't possible and what do you think about it?
22. How many exams do you have during one semester and how many credits does one exam normally count for?

Patients, patient's treatment and payments

23. Which type of patients do you normally treat at the clinic (considering if the patients are healthy adults, children, elderly; physical sick, mentally ill, etc.)?
24. What is the most usually treatment needs for the different group of patients (cons, endo, chirurgic, perio, ortho)?
25. Do you think it is enough patients?
26. Do you think the students usually get to do all of the recommended treatment during the semesters?
27. How much do the patients pay/who finance the treatment usually?

In conclusion

28. What is this dental school good at?
29. What could be improved?
30. How are the employment possibilities after graduation? Is it an advantage to have studied at the University of Brescia when you apply for work?
31. Is it something else you want to tell about the study, curriculum, clinic, university etc.?

6.2 Appendix II – Curriculum Aarhus

Year	Teaching course	ECTS	Subject
1 st	Preclinical subjects 1	5	Tooth morphology
			Clinical mentoring by elder semesters
			Toxicology
			Study start guiding
	Macroscopic anatomy	20	The digestive system and visceral organs
			Locomotor system
			Vascular system
			Nerve system
			Sensory organs
	Dental materials	5	Practical laboratory exercises
	Preclinical subjects 2	5	Clinical mentoring by elder semesters
			Hands-on training
	Dental chemistry and biochemistry	10	Introduction to endodontics, periodontics, dental pathology and operative dentistry
General chemistry			
Tooth morphology	10	Terminology	
		Macro morphology	
		Tooth formation and variations	
		Occlusion and articulation	
General histology	5	General histology	
	In total: 60		
2 nd	Preclinical subjects 3	5	Clinical mentoring by elder semester
	General physiology	5	General physiology
			Nerve system
			Sensory system
			Muscles and muscle control
			Endocrine system
			Gastrointestinal tract
			Metabolism and energy balance
	Dental chemistry and biochemistry 2	5	Digestion and metabolism
			Nucleic acids
			Protein synthesis and transports
			Human body's molecular defence
			Biology: Enamel and saliva
	Medical genetics	5	Dietary biochemistry: Vitamins, energy and nutrients
			General medical genetics
	Oral histology	5	Embryology of the face and oral cavity
			Tooth development
Eruption			
Oral tissue			
Salivary glands			
Regeneration of oral tissue			

	Studium generale	5	Disease and health in clinical practice and in modern health care system Theoretical ethics in clinical practice and health care systems Practical ethics with actual cases Knowledge and evidence in clinical practice and social odontology	
	Preclinical subjects 4	5	Dental pathology: Cariology, operative dentistry and endodontics Oral radiology Clinical mentoring by elder semester	
	Macroscopic anatomy, prosthetic module	5	Bones of the jaw The temporomandibular joint Muscles of the head and neck	
	General physiology	5	Heart Circulation Respiratory system Nerve system Endocrine system Kidneys Muscles Gastrointestinal tract	
	Microbiology and immunology	10	Composition of microorganisms Genetics Antimicrobial compounds Immune system Infection microbiology Oral microbiology Hygiene	
	Pathology	5	Pathological diagnosis Growth and cell changes Benign and malignant diseases Biopsies Inflammation and healing	
		In total: 60		
	3 rd	Clinical subjects FK 5	10	Comprehensive dentistry Gnatology Prosthodontics Dental pathology: Cariology, operative dentistry and endodontics Periodontology Oral Radiology Physiology Toxicology
		Anaesthesia and resuscitation	5	Local analgesia Anaesthesiology and nitrous oxide analgesia Resuscitation
		Pharmacology	5	Pharmacology
		Epidemiology and biostatistics	5	Epidemiology and biostatistics
		Optional subject	5	Acute dental medicine National clinical guidelines: Antibiotics in dental practice

	Clinical subjects FK 6	10	Comprehensive dentistry
			Clinical and oral physiology
			Prosthodontics
			Periodontology
			Psychology
			Dental pathology: Cariology, operative dentistry and endodontics
			Toxicology
	Surgery 6	5	General surgery
			General medicine
	Macroscopic anatomy, surgical module	5	Anatomy head and neck
		Nerves, veins and lymphatics	
Oral radiology	5	Oral radiology	
Bachelor project	5	Group exam, patient case	
	In total: 60		
4 th	Clinical subjects 7	10	Comprehensive dentistry
			Prosthodontic
			Periodontology
			Dental pathology: Cariology, operative dentistry and endodontics
	Surgery 7	5	Oral and maxillofacial surgery
			Oral pathology and medicine
	Children and adolescents 7	5	Somatic growth
			Development deviations
			Evaluation of diagnostics and orthodontic treatment planning
			Orthodontic biomechanics
			Practical training: Wire bending
	Clinical oral physiology	5	Orofacial pain conditions and dysfunctions
			TMD
	Gerontology	5	Physiology of aging
			Diseases and pharmacological aspects
			Communication
	Clinical subjects 8	10	Comprehensive dentistry
			Prosthodontics
			Forensic dentistry
			Clinical oral physiology
		Toxicology	
		Graduate project	
Surgery 8	5	Oral and maxillofacial surgery	
		Oral pathology and oral medicine	
Children and adolescents 8	5	Deviations	
		Orthodontic treatment planning	
		Early Interceptive treatment	
		Practical training: Wire bending	
Dental pathology: Cariology, operative dentistry and endodontics	5	Caries diagnostic and treatment	
		Preventive dentistry	
		Endodontics, emphasis on emergencies, complications, appropriate treatment	
Periodontology	5	Periodontal regeneration	
		Bone grafts/Biomaterials	
		Multidisciplinary treatment	
		Peri-implants infections	
		Supportive periodontal therapy	
	In total: 60		

5 th	Clinical subjects 9	10	Comprehensive dentistry
	Surgery 9	5	Prosthodontics Oral and maxillofacial surgery Resuscitation
	Pedodontics and community dentistry	5	Psychological development
			Cariology
			Dental trauma
			Developmental disturbances
			Dentitional abnormalities
			Space conditions and occlusion
			Oral mucosal lesions
			Periodontology
			Endodontics
	Pediatric aspects		
Orthodontics	5	Diagnostic and initial orthodontic evaluation Bend, insert, control and maintenance of orthodontic retention appliance	
Surgery 10	5	Oral and Maxillofacial Surgery Oral pathology and medicine	
Optional subject	5	Endodontics: Introduction and hands-on to instrumenting systems National clinical guidelines: Antibiotics in dental practice Oral radiology: Diagnostic	
Clinical subjects 10	10	Comprehensive dentistry Hygiene Emergency treatment in dental practice	
Prosthodontics	5	Examination, treatment planning, treatment, control. Crowns, fixed prosthesis, special fixed prosthesis, removable partial denture, complete denture, special dentures, crowns retained by implants, repairs	
Children and adolescents 10	5	Pediatric dentistry Oral gerontology Orthodontics	
Masters finales	5	Masters finales Graduate project	
		In total: 60	
1 st -5 th		In total: 300	

6.3 Appendix III – Curriculum Brescia

Year	Teaching course	ECTS	Subject
1 st	Behavioural sciences and scientific methodology	13	Evidence based science and team approach
			General psychology
			Statistics
			Informatics
	Histology	7	Medical history and bioethics
			Histology
			Physics
	Applied physics	6	Physics
			Chemistry
	Biochemistry and chemistry	6	Chemistry of macropolymers
			Biochemistry I
			Oral anatomy
	Human anatomy	10	Radiology and anatomy of the head and neck
			Topography and anatomy of the head and neck
Systematic anatomy			
English language	7	English language	
Applied biology	9	Applied biology	
		General and molecular genetics	
Students own choice	2	Biology and genetics applied in dentistry	
		In total: 60	
2 nd	Biochemistry and clinical biochemistry	8	Clinical analysis and clinical molecular biology I & II
			Biochemistry II
			Molecular biology
	Physiology	10	Cell- and neurophysiology
			Vegetative physiology
			Stomatognathic physiology
	Microbiology and hygiene	13	General microbiology
			Clinical microbiology
			Environmental hygiene
			Infection control
	General pathology	7	General hygiene
			General pathology
	Principals of dentistry and clinical scientific methodology	16	Methodology and preclinical exercises
			Research methodology
Gerontology			
Preventive community dentistry			
Epidemiology of dentistry			
Dental biomaterials I			
Students own choice	2	Oral hygiene instruction	
		Professional oral hygiene	
		In total: 60	
3 rd	Principals of dentistry II	15	Dental biomaterials II
			Laboratorial technics
			Endodontics
			Conservative dentistry
			Oral pathology
	Medicine science I	13	Bioethics II
Internal medicine			

			Acute medicine
			Clinical pathology
			Pedodontics
			Cardiovascular diseases
			Infectious diseases
			Anaesthetics
	Pathology	6	Oral pathology
			Histopathology and molecular structure of infections and neoplasm
			Pathology of the neck
			Notions of extraoral pathology
		Pharmacology	
Pharmacology	6	Pharmacology	
Diagnostics – images and radiology	6	Diagnostics with general images	
		Diagnostics with special diagnostics	
Students own choice	2		
Clinic	12		
	In total: 60		
4 th	Oral surgery	4	Oral surgery
	Medicine science II	10	Anaesthetics and treatment of acute medicine
			General surgery
	Neurology and psychology	3	Neurology
			Psychology
	Legal medicine	4	Legal medicine
	Special pathology	5	Special pathology
			Dermatology
	Discipline in oral medicine I	21	Laboratory technique
			Fixed prosthodontics
		Periodontics	
		Orthodontics	
		Cariology: comprehensive dentistry	
		Gnathology	
Clinic	13		
	In total: 60		
5 th	Restorative dentistry	7	Endodontics
			Conservative
			Periodontics
	Maxillofacial pathology and treatment	6	Oral surgery
			Maxillofacial surgery
			Maxillofacial surgery on children
			Otolaryngology
	Orthodontics	10	Orthodontics
	Pedodontics	5	Pedodontics
	Implantology	14	Fixed prosthodontics
		Removable prosthodontics	
		Periodontics	
		Oral surgery	
		Clinical oral medicine	
		Orthodontics	
Clinic	18		
	In total: 60		

6 th	Discipline in oral medicine II - Clinic	16	Fixed prosthodontics
			Removable prosthodontics
			Gnatology
			Periodontics
			Special oral pathology
	Discipline in oral medicine III - Clinic	18	Conservative
			Endodontics
			Oral surgery
			Pedodontics
			Orthodontics
	Treatment in oral medicine - Clinic	14	Clinical oral medicine
			Preventive community dentistry
	Student own choice	2	
	Master thesis	10	
	In total: 60		
1 st -6 th	In total: 360		

6.4 Appendix IV – Curriculum Tromsø

Year	Teaching course	ECTS	Subject
1 st	FIL 0700, Examen philosophicum	10	History of philosophy
			Scientific theory
			Ethics
	MED 1501, Medicine and odontology I	50	HEL 0700: Faculty of health sciences
			Introduction to medicine and odontology: Body structure, first aid course, biomolecules, cells and tissues
			Digestion, metabolism and biochemistry and nutrition I
			Generation, cell proliferation and cancer
			Respiration, circulation and kidney function I
			Inflammation and infection
			Professional competence development: Communication and ethics
Scientific competence development: Statistics and epidemiology			
	In total: 60		
2 nd	ODO 2005, Biomedicine I and science	30	Reproduction, embryology and genetics
			Infection control and disease
			Locomotor system: Skeleton and muscles
			Lungs, heart, vessels and kidneys
			Science: Statistics, epidemiology and preventive medicine. Scientific methods.
	ODO 2006, Biomedicine II	10	Gastroenterology, endocrinology and nutrition
			The nervous system
			Haematology and immunology
	ODO 2007, Oral anatomy and physiology	20	Tooth formation and morphology
			Tooth supportive tissues
Tooth eruption			
Oral histology, composition and function			
	Anatomy head and neck: Bones, muscles, nerves, veins, lymphatics		
	In total: 60		
3 rd	ODO 2513, Preclinical subjects	10	Preclinical training: Cariology, periodontics and prosthodontics
	ODO 2514, Dental biomaterials	10	Chemical composition and characteristics
			Scientific basis of use and choice of dental biomaterials
			Side effects
	ODO 2503, Oral ecology	10	Oral physiology
			Oral pathology
Oral microbiology			

	ODO 2505, Clinical odontology I	20	Dental pharmacology
			Toxicology
			Nutrition
			Oral surgery
			Oral medicine
			Cariology
			Periodontics
			Endodontics
			Prosthodontics and gnathology
			Gerontology
	ODO 2504, Community dentistry	10	Oral epidemiology
			Public health
			Prevention and health promotion measures
			Dental health care systems Dental health care systems administration: Laws, constitutions, social security etc.
		In total: 60	
4 th	ODO 3005, External clinic I	30	Dental practice in a public dental clinic (Duration: 4 months)
	ODO 3304, Clinical odontology II	Longitudinal study: Exam 5 th year	Oral surgery
	ODO 3208, Oral and maxillofacial radiology	10	Oral medicine
			Periodontics
			Cariology
			Endodontics
			Prosthodontics and gnathology
			Gerontology
			Oral radiology
			Maxillofacial radiology
			X-ray characteristics
			Radiation protection
	ODO 3324, Pedodontics and orthodontics	Longitudinal study: Exam 5 th year	Oral pathology and histology
			Maxillofacial growth
			Psychological development
			Occlusion and tooth eruption
			Preventive dentistry
			Dental trauma
			Emergency treatment
			Oral mucosal lesions
			Medical diseases
			Physical and mental developmental disorders and syndromes
			Endodontics
			Minor surgery
			Dental anxiety and odontophobia
			Sedation and nitrous oxide
			Occlusion and Angles' classifications
			Skeletal and dentoalveolare malocclusion
			Orthodontic examination, diagnostics, treatment planning, referring to orthodontic specialist and how to do simple orthodontic treatments

			Orthodontic examination, diagnostics, treatment planning, referring to orthodontic specialist and how to do simple orthodontic treatments
			Interseptic treatment
			Fixed appliance
			Orthognastic surgery
		In total: 40	
5 th	ODO 3324, Pedodontics and orthodontics	15	See 4 th year
	ODO 3304, Clinical odontology II	30	See 4 th year
	ODO 3505, External clinic II	15	Dental practice in a public dental clinic (Duration: 9 weeks)
	ODO 3901, Master thesis	20	A thesis of research, literature studies or casualty
		In total: 80	
1 st -5 th		In total: 360	