

# Perspectives on Dental Education in the Nordic Countries

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*Abstract:* The object of this review is to discuss the state of dental education and describe current developments at dental schools in the Nordic countries. The main focus is the undergraduate dental education; however, the postgraduate system will also be addressed. The curriculum model for undergraduate dental education in the Nordic countries is based upon the odontological tradition. The influence of biomedicine on dental education is increasing at present due to scientific and medico-technological developments and the altered disease profiles of oral and systemic diseases. These circumstances create new possibilities for dental education, but at the same time they raise some problems. In the long term, the strong biomedical influence on dental education will be an advantage to future dentists' function and tasks in health care systems in the Nordic countries. In the short term, it may result in an identity crisis for dental schools, students, and our profession, as we experience the evolution from the traditional odontological curriculum model to one significantly influenced by ongoing changes in the biomedical field. Continuing professional education and advanced training in clinical specialties are likely to play important roles in this evolution.

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Dental education takes place at different levels in all the Nordic countries. In addition to undergraduate dental education—the dominant educational activity in Nordic dental schools—there are vocational training, continuing professional education, and specialty training. Education in research skills is beyond the scope of this review.

There are eleven dental schools in the Nordic countries: two in Denmark, two in Finland, one in Iceland, two in Norway, and four in Sweden. Furthermore, Finland has a postgraduate odontological institution, which formerly had an undergraduate program. The heads of the schools meet in person regularly to exchange experiences. Most of the information in this review is based upon reports and discussions from these meetings.

In the 1980s and 1990s, there was a decrease in the number of students admitted to undergraduate dental studies in the Nordic countries, but in the recent past the number of admissions has increased. Table 1 shows the current admissions enrollment at these schools. The number of students admitted is determined and financed by the national governments. Presently, the total number of students admitted annually into the eleven Nordic dental schools is about 530. This corresponds to a ratio of about

one student per 40,000 citizens, except for Finland. In Finland, the ratio is one student per about 65,000 citizens. The number of entering dental students may increase further in the coming years, particularly in Sweden where an increase in admission has been proposed in a newly published report concerning the dental health care system.<sup>1</sup> However, in Sweden, the faculties have their own resources to increase the enrollment number. In Norway, the faculties are also of the opinion that there is a need to increase student enrollments. In Denmark, the dental associations also share this view.<sup>2</sup> Interest in pursuing a dental education in the student population is fairly high, as there are 4.5 to ten times as many applicants as there are student places available.

Although the educational outcomes have not been measured, the standards for dental education in the Nordic countries are fairly uniform with respect to clinical competencies, biomedical knowledge, and ethical and behavioral attitudes of the candidates. This is plausible because Nordic dental schools all have the same odontological tradition. In contrast to the stomatological educational model, the odontological clinical subjects constitute a central component of the curriculum. In addition, the stomatological schools emphasize dental research as an important

**Table 1. Annual number of students admitted to dental schools in the Nordic countries**

Country/School	Number of Students Admitted Per Year
<b>Denmark</b>	
Copenhagen	90
Århus	60
<b>Finland</b>	
Helsinki	35
Oulu	44
<b>Iceland</b>	
Reykjavik	6
<b>Norway</b>	
Bergen	48
Oslo	65
<b>Sweden</b>	
Göteborg*	40
Malmö	40
Stockholm	60
Umeå	40
Total	~ 530

\*The number of admissions is unofficially increased by about 20 students annually. This is a local decision at this particular university.

component of dental education. For many years, dental schools have sought to establish an odontological identity as a basic aim. This has important advantages, but also some limitations, which will be discussed later. Finally, in all Nordic schools, dental education is planned in such a way that it should result in graduates having general and clinical competencies in accordance with the EU recommendations.<sup>3,4</sup>

Another characteristic of Nordic dental schools is the high standards for the infrastructure and clinical equipment. Typically, schools have been modernized and renovated regularly, thereby underscoring an appreciation in these countries for the importance of an updated dental education.

Although there are many common traits in dental education in these countries, many differences exist in the odontological educational systems. This review will focus upon the state of dental education and current developments at the Nordic dental schools. Similarities and differences in the institutional circumstances of the schools, including demands on the schools, their educational philosophy, the educational system, and its regulation, will be discussed.

## Institutional and Educational Conditions

Until recently, most of the dental schools had odontological faculties at their universities or auto-

nous institutions. However, for years, the dental schools in Finland have been incorporated into the medical faculties as "Institutes of Dentistry." Ten years ago, the autonomous dental schools in Denmark were merged with the medical faculties at the universities, and health science faculties were established wherein odontology was organized as institutes like the medical institutes. In Sweden, institutional changes have also taken place. Two of the odontological faculties have been merged with the universities' medical faculties, resulting in medical-odontological faculties. The two remaining dental schools in Sweden and the two in Norway are still odontological faculties. An umbrella organization called the Health Science Academy, composed of the Faculty of Medicine, Faculty of Odontology, and Faculty of Public Health, was established in 2001 at Gothenburg, Sweden. This organization is referred to as the Sahlgrenska Academy. In Bergen, Norway, a Faculty of Health comprising the Faculty of Medicine and Faculty of Dentistry is under consideration.

Irrespective of the institutional conditions, it is remarkable (except for Denmark) that educational cooperation between the medical and the odontological areas has existed for many years. This is interesting because through all these years dental education in the Nordic countries has relied on the odontological tradition.<sup>5</sup> Nevertheless, the collaborative teaching efforts with medicine have changed over the years. Initially, the medical institutes and departments were responsible for teaching dental students in the basic science subjects and some paraclinical subjects specifically designed for the dental curriculum. In recent years, the approach has been to have common integrated courses for dental and medical students for some of the basic science subjects.<sup>6</sup> This development has taken place at some of the faculties in Denmark, Norway, and Sweden, while at other institutions, teaching in the basic science subjects is still done by faculties from the medical institutes. The most complete integration between medical and dental education has taken place in Oslo and at the Finnish schools. In Finland, the first two years of dental and medical education are integrated, while in Oslo, the first three and a half terms consist of a fully integrated study program for medical and dental students.

Despite the odontological model of dental education, there is, simultaneously, an understanding of the importance of a close relationship with medical education. Furthermore, an understanding of the interactions between oral and systemic diseases (dia-

betes, cardiovascular disorders) is growing in importance as a result of recent research findings and the increasing numbers of medically compromised dental patients. Undoubtedly, ties between medicine and dentistry will be strengthened in the years ahead as a result of advances in biotechnology and gene therapy developments.<sup>7,8</sup> Therefore, integrated education is of paramount importance for both medical and dental education; it is also logical because future physicians and dentists work together in the health care system.

While there are several good reasons for a close integration of dental and medical education, such an integration also raises some problems. Integrated courses for dental and medical students can result in dental students feeling ignored and perceiving that the teaching is being directed more towards the needs of medical than dental students. In other words, an identity crisis for the dental students may arise. This has happened at some of the faculties in Norway, Finland, Sweden, and Denmark. At some of the faculties, it has resulted in students dropping out of dental school during preclinical education. In addition, after the basic science part of the curriculum, some dental students have transferred to medical education. This is a cause for concern, and faculties must be alert to this problem in their curriculum planning. One dental school is admitting a larger number of dental students to compensate.

There may be another explanation for a potential identity crisis for odontology. Dental research has had a pronounced recruitment problem in the recent past. For this reason, research at the Nordic schools has weakened, which has a negative effect on dental education. What can be done to resolve this problem? One possibility is to strengthen the research by establishing research programs that combine dentistry, medicine, and public health and/or a combination of themes in basic biology with clinical dentistry. This requires an interest on the part of researchers in both the odontological and medical fields. Another important and related strategy might be to formulate a research policy for the dental schools that involves a balanced recruitment of dentists, physicians, and basic biological scientists.

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## Activities and Objectives of the Dental Schools

The essential and central activities at all dental schools in the Nordic countries are dental research

and dental education, both of which have to be undertaken at the highest academic levels. These two core activities are related in that dental education should have a sound scientific knowledge base within all clinical odontological disciplines. In principle, this requires scientific staffs and milieus at the schools for all the odontological disciplines. However, in reality it is extremely difficult to maintain a sufficient number of scientists in all these disciplines simultaneously; this problem will worsen in the coming years, which is a reason for concern.

At schools in Sweden, Finland, and now also in Norway, there is a considerable amount of specialty training, but it is organized differently in the three countries. Sweden has specialist educational programs in oral and maxillofacial surgery, orthodontics, endodontics, clinical oral physiology, oral radiology, periodontology, pedodontics, and prosthodontics.<sup>1</sup> In Finland, there are four approved specialties: oral and maxillofacial surgery, orthodontics, clinical dentistry, and community dentistry, which is divided into six subdisciplines. In Norway, there are four approved specialties: orthodontics, oral and maxillofacial surgery, periodontology, and pedodontics. Plus, there are specialist-like educational programs in cariology, oral radiology, endodontics, and prosthodontics.<sup>9</sup> The motivation to establish specialist programs in Norway was to educate competent clinical teachers at the dental schools in the different clinical subjects. The combination of undergraduate education and specialty training strengthens the schools' teaching and research programs, along with a considerable improvement in patient selection for these two core activities. Finally, in Denmark, there are only two specialties: orthodontics and oral and maxillofacial surgery. Specialist education in orthodontics takes place at the dental schools, while the oral and maxillofacial surgery program occurs in the hospital sector, as it does in the other Nordic countries. Furthermore, teachers at dental schools in all the countries participate in continuing professional education.

Dental schools in Sweden also have public health responsibility in both general dentistry and specialty care. In Finland, the university dental clinics were closed a few years ago and transferred to city public health departments. For the school in Helsinki, the problem of having a suitable number and type of patients for the clinical training of students has increased in the last years. There, dental care became a public health care responsibility, and the university maintained its educational responsibility. For two of

the schools in Sweden, the public dental health department is economically responsible for the clinical activities. Resources are allocated to health care activities both in Sweden and Finland. In Norway, dental schools are not required to provide treatment, but to obtain patients for their clinical programs they seek the cooperation of dental health care services in the university cities. The economic compensation to these health care services is minor. In Denmark, the dental school does not have a health care responsibility. However, the state budget determines that the schools must have responsibility to meet the needs of selected patient groups that need advanced therapy. Responsibility lies in the hands of competent scientific staff members at the schools. There are no specific resources allocated to this activity.

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## The Organization of Dental Schools

The different internal organizational structures in Nordic dental schools reflect the schools' educational and clinical responsibilities. Typically, schools are organized into departments with associated clinics. The number of departments ranges from seven to thirteen, and the names of departments are similar in these schools. At some schools, a specific department may house several related disciplines. A new model has recently been introduced in Bergen, Norway, where the departments have been merged into a Department of Odontology as one of two separate units (the other unit being the Clinic of Dentistry).

In the past, clinics were typically affiliated with separate clinical departments. Nowadays, the clinic is either organized as one entity and run by a head of the clinic or, in the other model, the clinic is divided into a few major subunits (for example, a clinic for adults, a clinic for children, and a clinic for the specialties). At the school in Copenhagen, the clinic organization follows the first model. However, the second model seems the most common: typical examples exist in the schools in Oslo and Stockholm. This change in clinic organization reflects a change in the philosophy of clinical training towards an integrated teaching approach (for example, an integrated clinic for adults and an integrated clinic for children).

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## Educational Philosophy and the Structure of Undergraduate Dental Education

As discussed above, the educational model at the eleven dental schools in the Nordic countries relies on the research-based odontological model, but with a strong influence from biomedicine. This is the situation for schools in countries both inside and outside the European Union (EU).

The dental curricula in the Nordic countries are regulated by specific educational guidelines imposed by the government or by laws that govern the dental health care system. These laws, however, provide only a framework for the curriculum. In Denmark, for instance, the government has established minimum requirements for the curriculum content. Overall, the Nordic schools have some freedom in the planning of the curricula within a relatively broad framework. In Norway, the universities define the structure and the contents of the curricula. In Sweden, the central objectives of dental education are government-determined. These are supplemented by objectives developed by each school and, as in Norway, the curricula structure and the contents are defined by the schools. This may explain why the curricula are so different among the schools. In Finland, the government determines the framework for dental education by dictating the courses that comprise the core curriculum, and the government also requires language courses in dental education. However, the details of curriculum content are determined by the faculties/universities of the Finnish schools.

Traditionally, the dental curricula in the Nordic countries have been divided into two parts: a basic science and preclinical phase, followed by a clinical phase. During the last ten to fifteen years, this curricular structure has gradually changed into a more direct integration of biomedical subjects and clinical odontological subjects with a stronger emphasis on internal medicine. At some Nordic schools, courses in human diseases have been introduced. Patient contact early in the curriculum has also been established. At most schools, this has been done without a fundamental alteration of the two-part curricular structure. At other Nordic dental schools, the tra-

ditional curricular structure has been disintegrated, and biomedical, paraclinical, and clinical subjects have been mixed throughout the education. The dental school in Malmö, Sweden, is the best example of an integrated curriculum model.

In all the Nordic countries except for Iceland, the undergraduate dental education has a duration of five years. In Iceland, dental education lasts six years. The curriculum plan for dental education in Scandinavia has traditionally been a ten-semester review of the basic science and clinical subjects, rather than focusing on the candidates' desired competencies at the end of the curriculum. Instead of using the competencies needed for professional practice as a starting point in curriculum planning, students are expected to pass each of the traditional basic science and clinical disciplines. However, this new competency-based planning method now appears to be the future curriculum format. Essential elements in this method are an evaluation of the development in disease patterns in society, population demography, socioeconomic changes, new diagnostic and treatment methods, and the effect of preventive efforts. In this regard, the EU dental directives concerning clinical proficiencies and minimum requirements have been valuable.<sup>3,4</sup>

Teaching and examination methods have been under intense scrutiny in recent years. Lectures, seminars, and exercises have historically been the dominant teaching methods. The introduction of problem-based learning and the case method, however, resulted in a substantial change in the teacher's role, and the curricula in many schools is now characterized more by student-teacher dialogue. The students are more active in the learning process, and the teacher's role is to facilitate learning as consultant and coach. At some of the schools, for example, in Malmö and Oslo, the problem-based learning (PBL) method is now the predominant teaching form. Other schools (like Bergen's) use PBL in a modified version, while still others (like Copenhagen's) only use PBL or the case method for specific curriculum blocks. Finally, there are also schools (like Gothenburg's) that have not changed to the new learning practice. In this connection, it should be emphasized that studies comparing one teaching form to another with respect to the acquisition of knowledge and students' understanding of odontology have not yet been published.

Clinical training in the Nordic dental schools has for many years been subject-specific. Over the last ten to fifteen years, this has gradually changed so that the clinical subjects have been integrated into

a comprehensive care clinical teaching model. Many faculties believe that the comprehensive care approach is a sound teaching principle. The patients are regarded as whole individuals, and the total disease condition for the patient is the central element in the planning of treatment and the therapy that follows. For example in Stockholm, the clinical teaching is fully integrated. However, the comprehensive care model of teaching is not without problems. At some faculties it has been difficult to allocate clinical teachers, who have teaching experience and interests for clinical competences in all of the clinical subjects in integrated clinical teaching programs. Another problem that schools encounter is the difficulty of assigning full responsibility for the evaluation of student competences in the separate clinical subjects. As a result, many schools are struggling to find the right balance between subject-specific and integrated clinical teaching.

The extent of the clinical training varies among schools. If early patient contact during the first terms is ignored, clinical training involving patients does not begin until the fifth term in most schools. However, in Gothenburg, clinical teaching with patients does not start until the seventh term. Instead, extensive preclinical exercises on phantoms are provided. At all schools this form of exercise takes place, but its extent differs. The variation in the number of hours devoted to specific subjects (that is, to preclinical and clinical exercises) was also shown to occur with the basic science subjects, according to a 1998 questionnaire.<sup>6</sup>

Evaluation of student performance has not changed much over the last two decades. The students' clinical proficiencies are normally evaluated currently during the clinical phase of the curriculum, and their progress determines movement from one term to another. The theoretical knowledge is evaluated by final written or verbal exams. But there has been a clear tendency in recent years to change the written exams from testing recognition of specific knowledge to testing understanding. In this connection, Nordic schools are considering changes to evaluation techniques that better measure actual performance. Some Nordic schools are now experimenting with the Objective Structured Clinical Examination (OSCE) because of its ability to measure student comprehension across several subjects and to allow assessment of actual patient care skills.

As indicated earlier, it has not been shown that variations in curriculum structure, teaching forms, and number of hours devoted to different subjects result in graduates with remarkably different clinical

competences among the Nordic countries. Maybe the basic educational philosophy is of decisive importance for the quality of undergraduate dental education.

At all the dental schools in the Nordic countries, internationalization of dental education is regarded as very important. All schools participate in the undergraduate European students' exchange program. To improve curricula and obtain information about innovation and best practices at other schools, most of the Nordic dental schools have been visited by a team of international peers in the DentEd Thematic Network Project. At the schools in this region of Europe, there is a considerable support for the internationalization of dental education.

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## Postgraduate Odontological Education

Postgraduate odontological education activities comprise vocational training, continuing professional education, and specialization in one of the clinical disciplines.

Vocational training takes place differently in different Nordic countries. In Denmark, the odontological candidate is clinically trained under supervision in a private practice or public clinic for a year to obtain license to practice independently. However, there is no formalized teaching program for this training period. In Finland, there is a six-month vocational training period, though the ministry is presently considering increasing it to nine months. Until 1994, Sweden had a vocational training program similar to Denmark's, but it was after an undergraduate education of nine terms in contrast to ten terms in Denmark. When the vocational training was eliminated in Sweden, undergraduate dental education was increased to ten terms. Norway does not require a vocational training period. Swedish and Norwegian candidates obtain a license to practice immediately after their final dental exam. As in Sweden, the fifth study year in Norway includes a few weeks in a dental practice outside the dental school. Sweden is now considering whether to increase the experience in dental practice to two months.

Due to the explosive increase in knowledge within the health sciences, including dentistry, and the need to increase the scholarly foundation of dental education, Scandinavian dental educators have

decided to change the undergraduate curriculum to a core curriculum. This will imply a demand for a compulsory vocational training period.

Continuing professional education is important, and it is organized differently in the Nordic countries. Some schools organize continuing education courses (for example, the Institute of Dentistry in Turku, the Reykjavik Dental School, and the schools in Århus, Malmö, and Umeå), but typically dental associations in the countries have assumed the responsibility for these activities. Furthermore, dental companies offer courses regularly to promote their products. Current discussions revolve around to what extent continuing professional education should be mandatory for academic health care personnel as a requirement for maintaining a licence to practice. In some countries, the governments prefer that continuing professional education be a university task in order to sustain its independence from business interests and to maintain a high educational level. Perhaps, continuing professional education in the future will be regulated because of these considerations. Medico-technological developments, changing demographics, and an increase in the number of medically compromised patients also require a shift from courses that are purely odontological to a mixture of odontological and biomedical courses.

In contrast, educational activities for specialists are regulated in the Nordic countries by the national health authorities, which determine what subjects specialists must take. Likewise, the educational programs are regulated. As already mentioned, some of the educational activities for specialists take place at the dental schools; however, in Sweden these activities also take place at specialist clinics. In Finland, some aspects of specialist education take place outside the dental schools—in health centers and hospitals, for example. However, this type of education requires senior teachers and falls under the responsibility of the faculties.

Except for oral and maxillofacial surgery, the length of specialist training is three years. For oral and maxillofacial surgery, training programs vary from four to six years. Specialist education is founded on three main pillars: theoretical studies, clinical training, and a scientific project. Typically, the clinical activities comprise about 70 percent of study time. The theoretical studies comprise courses in scientific methods, statistics, epidemiology, subject-specific courses, and courses in related odontological and medical disciplines. The specialty study

program is completed with an exam at which documented cases are presented by the candidate.

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## Summary

This article has reviewed both the undergraduate and postgraduate odontological educational systems in the Nordic countries. Due to common social and cultural backgrounds, the objectives and the quality of undergraduate dental education appear to be similar at the eleven dental schools. This commonality produces candidates with general and clinical competencies that match the EU recommendations for clinical proficiencies.

The basic educational philosophy for dental education in the Nordic countries relies on a research-based odontological model with a strong influence from biomedicine. This trend will strengthen in the coming years. In the short term, however, this overlap may create an identity crisis for the dental schools and dental students. For curriculum planners, it is a major challenge.

Nordic students obtain similar competences at the end of their dental education, but the curriculum structure, teaching methods, and hours devoted to different subjects differ considerably among the schools. There is no evidence that one curriculum model is superior to others, and the schools must realize that students' expectations have changed. These changing needs and expectations will result in teaching methods characterized by dialogue among students and teachers. Examination methods will also change in the future to enable faculty to actually assess student competence. Therefore, the teachers must develop pedagogic skills that allow them to function effectively in this changing environment.

Due to changes in the core curriculum together with a stronger academic element in dental education, the demands for vocational training and compulsory continuing professional education will increase. It is possible to predict that the odontological educational system of the Nordic countries in the future will rely upon a core dental undergraduate

curriculum followed by a vocational training period and regular professional updating in a systematic continuing educational program. A small percentage of dentists will also obtain a three- to four-year specialist education in one of the clinical disciplines.

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