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CASE REPORT

Swedish dental students' clinical notes and reflections as part of a case-based examination – challenges for undergraduate education

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ABSTRACT

Clinical records are the basis for clinical reasoning, diagnostics, treatment planning, and management as well as for management of the patient and the outcome of the treatment, and therefore an important aspect of health professionals' work. Several articles emphasize the importance of adequate and correct content in these records. Previous research shows that even health professionals need to improve the content and structure of their clinical records, for them to give the information needed for various needs. The focus of this article are the clinical records of undergraduate dental students. The aim of the study was to explore patterns of adequate and inadequate content in clinical notes of undergraduate dental students in their final year of education. Secondly, whether these results could provide insights for development of health professions education.

Data comprised of 33 cased-based examinations collected during January 2020 at the University Dental Clinic, Department of Dental Medicine, Karolinska Institutet, in Huddinge Sweden. Also, data included teachers' assessment of these examinations. The texts were analyzed with thematic analysis.

Analytical results showed three themes. The first theme, (i) *Professional content knowledge*, concerned information in patient history, status, diagnostics and treatment plan, and an information ambiguity. The theme also included the students' use of professional terminology and the choice of articles to support reflections. The second theme (ii) *incomplete method of investigation* involved the actual patient interview, but also students' various misunderstandings of the template. The third theme was (iii) *Academic formalities.* This theme concerned students' understanding of the purpose of referencing and its function, but also a non-use of references, the use of irrelevant references, errors in the given citation style, and an incorrect structure of the text according to the template.

In conclusion, results showed the need for continuous training in clinical note-taking and reflections during dental students' professional education. In this training, teachers' assessment is important for students' development of professional literacy and professional judgment. Also, a continuous reminder of science and proven experience as the basis for the profession which is also made visible through academic formalities.

Keywords: clinical notes, patient records, professional literacy, professional judgement, health professions education, patient safety.

Introduction

Several research articles emphasize that clinical notes create the basis for clinical reasoning, diagnostics, treatment planning, and management as well as for management of the patient and the outcome of the treatment[1,2]. Clinical notes are thereby an important aspect of professional knowing within health professions, related to *professional literacy practices*, that is, what professionals are expected to read and write as part of their work. This theoretical point of departure is based on the sociolinguistic tradition New Literacy Studies, where reading and writing are seen as practices that are socially developed in relation to specific contexts; changing over time as a consequence of e.g. the implementation of new tools and technologies but also societal decisions[3-6]. Examples of changing technologies specifically related to clinical notes are various electronic patient records[1], whereas national and international standards for documentation within dentistry are examples of societal decisions that have an impact on what and how to document in clinical records. Within Swedish, European and International dentistry there are some standardized protocols that are used for clinical and research purposes[7,8]. Obviously, clinical records are part of the daily work of health professions like e.g., surgeons[9], nurses[1], and dentists[2]. Clinical records are also used for communication with colleagues within a health profession as well as between different health professions, but also with patients of various ages. As in other professions, they are thereby a central means for interaction in the context of daily work[6]. Therefore, it is important for universities to ensure that health professions are trained to produce high-quality clinical notes. To ensure this, it is important to identify patterns of clinical notes made by students in health professions education (HPE) to provide them with tools that develop their professionally adequate documentation. It is of course evident that a basic aspect of these tools consists of a professional terminology relevant for dental students. This terminology is of medical character: it relates to anatomy and pathology of specific parts of the human body, but also of terminology related to treatment and diagnosis, as well as to the actions in the process of eliciting the information needed from the patient. In a previous study, problems in student's early clinical notes were studied[10]. The aim of the study was to explore patterns of adequate and inadequate content in clinical notes of undergraduate dental students in their final year of education. Secondly, whether these results could provide insights for development of HPE.

Previous research

Studies relating to clinical records within health professions all emphasize the importance of comprehensive and accurate clinical records within and between health professions[1,2,9,11,12]. The articles by Charangowda (2010)[2] and Mathioudakis et al. (2016)[11] both emphasize the importance and need of the quality of clinical records. According to Mathioudakis et al. (2016)[11], there are several reasons for why the format of clinical records vary. Firstly, the formats are not consistent between health professionals and institutions in different countries. Secondly, there may be personal variations, related to each health professional's experiences. Here years of work experience but also specific previous incidents and

contextual aspects of the cases influence the individuals.

Most of the problems raised in these articles concern record-writing practices by professionals, that is, shortcomings that have or may have consequences for patients/clients and strategies for improving the records. In the study of Bjerkan et al. (2021)[1], electronic patient records (EPR) were implemented in order to replace the handwritten documentation practice, improve the structures of nursing documentation, and to promote increased standardization. Another article related to nurses documentation[12] concerned a retrospective audit of the national Swedish template for patient protocol (VIPS, cf. Florin et al. 2013)[13] of 55 patients with hip fractures. Most of the patient protocols were deficient, although there was a variation in types of deficiencies – from incomplete information to missing nursing plans. A conclusion was that some of the deficiencies had consequences especially for patient safety. The study of Bozbiyik et al. (2020)[9] is based on an audit of operation notes from a period of four weeks, where 150 operation notes were analyzed and reviewed in relation to specific guidelines that were complemented with seven further parameters. In order to improve the quality of the surgical notes, the results of the audits were reported; the guidelines were discussed; operative note proforma was developed, an education session on the expected parameters to be documented for the surgical notes was given. The results reported after a third audit show a clear improvement (minimum 80 %) in all parameters of the operation notes.

One of the comments in the discussion that we specifically noted is "It is not easy to recover a habit that has been settled for a long time" (Bozbiyik et al. 2020, p. 757)[9]. A conclusion of these studies, as well as of the ones reported in a previous article[10], is that it is crucial already during undergraduate education to identify patterns of insufficient knowledge or habits that do not comply with standardizations and recommendations for each of the different health professions.

Methods

The context for this study is dental students' clinical note-taking and their reflections concerning these notes. Data consisted of cased-based examinations that were voluntarily contributed by 33 students. These examinations were collected and anonymized during January 2020 at the University Dental Clinic, Department of Dental Medicine, Karolinska Institutet (KI). The case-based examinations relate to a teacher constructed template for clinical records, used in the undergraduate Study Programme in Dentistry (Figure 1 and for the original template in Swedish, see supplemental file 1). The students in this study were in their fifth and last year of the Study Programme in Dentistry. In total, 33 case-based examinations (411 pages), were subject to a thematic analysis.

Three representative case-based examinations and their assessor's comments are used to give examples of the outcome. Due to their large size, they are in the form of appendices. All appendices contain the letter *a* or *b* in their names, where *a* indicates the original Swedish version, while *b* is the author's translation to English.

The case-based examinations comprised the final examination in the subject Orofacial pain and jaw function, which is a part of the course Clinical Dentistry 6 in semester 9

(https://utbildning.ki.se/course-syllabus/2TL034), at the dental program at Karolinska Institutet. For a detailed description of the dental program, see previous publications[10,14,15]. The subject is represented in several courses during the dental program. The course that is specifically focused on in this study is the fourth course in the subject, which corresponds to 5.8 ECTS credits, and starts already in semester 5. This means that the students have practiced writing the journal in previous semesters during clinical skills training in semesters 8 and 9, before they are examined at the end of semester 9.

The template contained detailed instructions on what to include under each heading (Appendix 1b) and the students were also given the assessment criteria so that they knew what was expected of them (Appendix 2b).

Description of the examination and assessment criteria

The assignment for final examination is case-based, that is, each student has a patient they treat in their clinical part of the dental programme and this patient is processed in their examination. This means that parts of the text already exist in each patient's record, which have been written by the dental students in conjunction with meeting the patient. Thereby the assignment is characterized by summarizing all the information they have concerning the patient, make conclusions about diagnosis and treatment, and finally reflect over the case as a whole with the help of relevant scientific articles of each student's choice. In principle, the students process previous information and reflect upon it.

The assessment criteria follow the template for the task with similar headings and sub-headings. The assessment criteria are given to the students in advance (Appendix 2b). Furthermore, indications as to what kind of information is expected are given in relation to the descriptors for the *pass-grade*. For a *fail*, common descriptors are for instance missing, inadequate or wrong information, and irrelevant treatment, as well as illogical structure within a section, list of references is incomplete, do not follow the given citation style or are irrelevant for the student's case.

Thematic Analysis

Coding

Already during the coding of data, we noted that there was only one *pass* of a total of 33 students in the initial assessment, that is, one student passed without remarks. For a pass, the answer in each area must be complete and correct. However, for each of the codes there were varying numbers of students that passed part(s) of the examination assignment, shown in Table 1. Students were given feedback on the content of their answers and were expected to complement and/or correct them and resubmit their assignments. After the first revision of students' answers, eight students' answers were not yet sufficient for a *pass*, and still, after the second revision two students were assessed with a *fail*. In relation to each code the quantitative results for pass were the following:

Table 1: Description of the varying number of students passing each part of the examination assignment divided on each revision after assessor comments.

	Pass *first version*	Pass *first revision*	Pass *second revision*	Pass *third revision*	Pass *Total students*
Treatment plan	25	8	0	0	33
Diagnosis	14	15	4	1	33
Patient history	7	17	9	0	33
Assessment	7	20	6	0	33
Status	3	25	4	1	33

According to the procedure of thematic analysis, after **1)** familiarization with data and familiarization notes we started the **2)** systematic data coding for each student in accordance with the following analytical question: what content is noted vs what is not expressed in the final examination? The initial coding relates to identifying patterns in these examinations[16,17].

From codes to themes

In the third step **3)** we analyzed the codes in order to initially find recurring themes within the codes[16,17]. Most of the information needed, the students already had in the journals for their respective patients, that is, their individual cases. The main assignment for them was to ***a)*** use this information for a new template, ***b)*** complement with relevant scientific references, ***c)*** conclude the information in the journal in a diagnosis and a treatment plan as well as ***d)*** use the articles for a reflective summary. The students were expected to search for scientific articles and make a judgment of which ones were most relevant for their individual cases. Furthermore, they were expected to use the information in these to argue for their findings, treatment suggestions and final reflections.

The initial themes were then **4)** reviewed, that is we compared the codes within and between each theme to identify possible overlapping or contradictions, which eventually resulted in corrections to generate distinctive themes. In a fifth step **5)** the themes were refined, defined, and named. Finally, **6)** the report was written, and extract examples were chosen for the themes.

Results

In the fifth step of the thematic analysis the following three themes were constructed: ***(i)*** Professional content knowledge, ***(ii)*** Incomplete method of investigation, ***(iii)*** Academic formalities. They are hereby presented and complemented with excerpts from data:

Professional content knowledge

Characteristic of this theme is the different areas of insufficient professional knowledge that becomes visible in students' answers and in the teacher's feedback to them (for examples see Appendices 3b, 4b, 5b, and the

assessors' comments in Appendix file 6b). There were six areas identified within this theme with either missing, inadequate, or wrong information. They were as follows:

a) **Information in patient history:** Missing or inadequate information.

b) **Information in status:** Missing or inadequate information.

c) **Information in diagnostics and treatment plan:** Missing or wrong information.

d) **Information ambiguity:** A mixture between patient history and status under the respective heading.

e) **Use of professional terminology:** Difficulties to discriminate between the use of everyday or professional terminology, resulting in an incorrect terminology.

f) **Choice of articles to support reflections:** Irrelevant choice of articles.

Common characteristics for ***a)***, ***b)*** and ***c)*** was that information was missing in patient history and status, and the consequence of this was wrong diagnosis, and inadequate treatment plans.

However, areas that students perform well in concern the description of intraoral patient history and status, such as the oral cavity, but also description of general health, allergies, medication, and areas that are familiar from all other subjects in the dental curriculum that they have processed previously in their education.

Incomplete method of investigation

This theme is represented by insufficient methods of the investigation, specifically concerning patient-contact and the use of the patient-record template.

a) **Interviewing:** Incomplete information retrieval (see section Current complaints in Appendices 3b, 4b, 5b; see also first paragraphs for students 1, 2 and 3 in Appendix 6b).

b) **Misunderstanding of template:** Inadequate, wrong or missing information in relation to headings, and misinterpretation of structure, e.g., incorrect use of the template (see Appendix 3b: In sections Consequences of pain; Parafunctions; Sleep; Mental health; Status of orofacial pain and jaw function; and Diagnosis; see also Appendix 4b: Information should be moved from Parafunctions and Jaw functions to Current complaints; see also Appendix 6b: Student 1 bullet points number 2, 3, 5, 7 and 8; Student 2).

Academic formalities

This theme is characterized by an insufficient use of referencing, in terms of connecting professional judgment to scientific evidence, for instance providing correct reference to professional decisions and reflections. Also, this theme includes an incorrect structure of the text within a heading, which may lead to misunderstandings.

a) **Incorrect structure of the text.** This applies to text within a specific area, and to text placed under wrong headings or areas, e.g., incorrect use of template (see Appendix 3b: Current complaints does not include the requested information; see also Appendix 4b: Information should be moved from Parafunctions and Jaw functions to Current complaints; see also Appendix 6b: Students 1 and 2).

b) **Incorrect structure of referencing.** Non-use of references, use of irrelevant references, and/or errors in the citation style (see Appendix

3b: In Assessment there are no references, and under References only two out of three references are provided and not in the Vancouver citation style; see also Appendix 6b: Student 1).

Discussion

The main finding of this study was that Swedish dental students' clinical protocols and reflections in a case-based examination are inadequate and inaccurate in terms of information in the different parts of the protocol, but also concerning the method used for the investigation, and academic formalities.

When it comes to the first theme, e.g., the *professional content knowledge*, the students provided missing, inadequate, or wrong information in the areas: ***1)*** *patient history,* ***2)*** *status*, as well as ***3)*** *diagnostics and treatment plan*. For patient history this concerned ***i)*** the patients experience of problems, patient problems and how they were affected by external and internal factors such as stress, trauma or previous treatment, ***ii)*** the patient's perceived problems based on character and localization and how these factors affected the jaw and chewing function, ***iii)*** missing descriptions whether the patients had tested any previous treatment/-s and if so, the result of that treatment, and ***iiii)*** if there were any temporomandibular joint noises, parafunctions such as gum chewing, nail biting, teeth grinding etc. The latter was common for students to miss. For status, on the other hand, missing or inadequate information concerned extraoral status for instance the neck, jaw, mandibular range of motion, that is, jaw movements, as well as joints and jaw muscles. When it came to diagnostics and treatment plan, missing or wrong information extracted from the clinical examination – that follows a validated and standardized international protocol with a specified diagnostic tree[8] – resulted in incorrect or missing diagnoses. If diagnoses were incorrect or missing that lead subsequently to incorrect treatment plans with either lack of or wrong treatment approaches or wrong order of treatment approaches. In addition, no student wrote about the follow-up of the treatment. In regard to the area concerning ***4)*** *information ambiguity*, students could not discriminate between content that related to patient history and to status. Also, the students could not motivate the diagnosis from patient history and status. This was common for students and indicates an ambiguity in what content was expected to be placed under which heading. When it comes to the area regarding ***5)*** *use of professional terminology,* the students showed a difficulty to discriminate between the use of everyday or professional terminology, which resulted in an incorrect terminology. This was specifically obvious in the patient history as well as status parts where the students mixed the terminologies. The students used the patients' own words in status instead of the expected professional terminology, whereas they used professional terminology in patient history instead of the patients' own words.

For the second theme, e.g., the *incomplete method of investigation*, students showed difficulties during patient ***1)*** *interviewing* in terms of not posing follow-up questions, which made the information retrieved incomplete or even led to false diagnosis and treatment plans. Also, the students showed that they ***2)*** *misunderstood the template* by placing wrong, inadequate or no information in relation to headings.

A general characteristic of the above results is that the accuracy of student descriptions was insufficient in most parts of the assignment, except for areas processed previously in education, such as the oral cavity, general health, and allergies. This finding is in concordance with the findings of previous studies indicating that students' clinical notes are professionally acceptable when they write about a content and/or in a context that is familiar[1,10,18-20]. This study set-up cannot provide answers to why students have difficulties providing adequate and accurate information in the patient records. However, in a study by Meek (2005) it is proposed that these shortcomings might be due to insufficient knowledge and guidance in professional writing[21]. All kinds of patient documentation, such as patient records, clinical notes, referrals, etc. are crucial to ensure both the aspects of patient safety and the quality of patient care. Therefore, absence of accurate or adequate information might risk both aspects and place patients in a risk and in worst case in a fatal situation, non-dependent of health discipline[1,12,22]. This stresses the need to provide students with necessary tools and skills for professional writing. As dental students, students in other professions, such as nursing and engineering, are trained in academic and professional writing during their undergraduate education. However, they learn most of their professional writing in their specific work context, rather than attending formal undergraduate teaching[1,23]. This suggests a need to provide undergraduate students in professional education with authentic professional contexts for their writing and professional demands on their writing[23,24]. This affords them with a situation where the professional knowing is needed[25], so they became aware of writing as part of the profession. The professional aspect may be more visible in the professional context, but the academic aspect – in this case the scientific evidence (shown by referencing and reflection) as ground for professional judgments, is as important, but may be less visible. From a health professions perspective, assignments as this case-based examination makes both of these contexts visible for students, explicitly showing them the connection and importance of both professional and academic aspects[21]. Thus, the linkage and dependency of academic and professional literacy in professional education becomes visible.

According to Dias et al. (2013)[26] there is an intertextual connection between the writing students do in an academic context such as undergraduate education and the writing in a professional context. The transition that students face in professional education needs to be supported. This highlights that teacher feedback in assignments, such as this case-based examination, is a valuable resource for the students' learning and professional development. Indeed, the results from this study confirm that students, here in semester 9, need support when shifting between the academic and professional context, and also an understanding of their relation to the profession of dentistry. Professional motivation and arguments are a vital part of professional judgment, and part of the information given to patients that justifies and explains the treatment plan.

When it comes to referencing, the results indicate that students did not fully understand

the purpose of referencing and its function, and the problem with insufficient accuracy was also present in this part of the case-based examination. This is based on the findings from the first theme, e.g., the *professional content knowledge*, for the area ***6)*** *choice of articles to support reflections* in which students in general made irrelevant choices of articles, e.g., chose articles that had no connection to either the diagnosis or to the treatment plan, but there was also a lack of articles. This is also based on the findings presented in the third theme, e.g., *academic formalities*, and its second area ***2)*** *incorrect structure of referencing* where there were examples of non-use of references, use of irrelevant references, and errors in the use of given citation style, which was the Vancouver-style.

This topic has previously mainly been addressed in relation to plagiarism[27] when it concerns undergraduate students, or the practice of academic writing related to scientific articles and the review process[28]. This indicates that academic requirements to a professional context, that is, the scientific connection to practice – especially regarding professional literacy – may be challenging for students, but also have a direct effect on the professional context[9,22,29]. For instance, irrelevant articles, irrelevant and non-use of references implied that some students' treatment plans were arbitrary. In the same way that lack of accuracy or adequacy in the students' descriptions of a specific patient can endanger patient safety and quality of patient care, also errors in formalities may have consequences for the students' professional decisions concerning diagnosis, treatment plan and epicrisis, and subsequently for patients[1,12,22]. This again emphasizes the need to provide students with tools and skills for selecting and critically assessing relevant scientific evidence for professional decisions, in which patient values are integrated with best clinical evidence[30].

Generally, insufficient accuracy was observed in both professional and academic subject areas. In the area ***2)*** *misunderstanding of template*, of the second theme, e.g., the *incomplete method of investigation*, as well as in area ***1)*** *incorrect structure of the text* of the theme *academic formalities* results of the analysis indicate that students place wrong, inadequate or no information in relation to the headings of the template. Further, it was also shown that students misinterpret the structure and instructions of the provided template. This results, in turn, in a text that could not provide professionally adequate and coherent information under each heading, with the consequence of, as previously mentioned, placing patients in risk[12,22]. Inadequate, missing, and wrong information in relation to the investigation, and to the professional language used, indicates inadequate professional content knowledge and judgment skills.

A greater number of students seem to pass the part called *treatment plan* already in their first version, which may be related to the fact that specific examples are already provided in the teacher-constructed template. This is in contrast to the parts of *patient history* and *assessment* that are based on the students own performance in interviewing and professional writing skills, subject knowledge, and professional judgment including critical selection of articles. This may be explained by

the fact that the students are required to be professionally independent in some point of the task. This includes that the students need to independently identify the phenomenon or condition described in the text from the specific patient case, that is, move from detail to whole, and then use this information to make a professional judgment supported by scientific evidence[31]. This process of work is recurrent in the professional setting, but the shifting variable is the patient case that gives different phenomena and conditions to depart from[32].

Conclusion

A conclusion from this study is that students need continuous training in clinical note-taking but also training for reflecting on their notes during their professional education. It is an important part for them in developing their future professional judgment and appropriating the professional literacy demands. For this development, teachers' assessment is important. Also, another conclusion is that students need to be continuously reminded of the relation between science and proven experience in the profession, which is also made visible through academic formalities, such as relevant references to professional judgment and arguments. However, as previous research indicates, the quality problems exist also for professionals in health professions[1,9,12]. These studies contribute to emphasizing the importance of recurring work with clinical notes in undergraduate health education as well as discussions of professional skills and ethics in relation to consequences for patients.

Statements and Declarations:

Author contribution:

Maria Christidis, Nikolaos Christidis, and Viveca Lindberg had the main idea for the article. However, all authors contributed to the study conception and design. Thematic analysis was mainly performed by Helen Helo and Sandra Koj, with guidance from Maria Christidis. The manuscript was drafted and critically revised by all authors. All authors read and approved the final version manuscript.

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The authors have no conflicts of interest to declare.

Data availability:

The raw material and thematic analysis are available from the corresponding author on reasonable request.

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Appendix legends:

Appendix 1a: Template for case-based examination containing detailed instructions on what to include under each heading, in its original version in Swedish.

Appendix 1b: Template for case-based examination containing detailed instructions on what to include under each heading, authors' English translation.

Appendix 2a: Assessment criteria for the case-based examination containing detailed instructions on what is expected for a "pass" and what renders a "fail", in its original version in Swedish.

Appendix 2b: Assessment criteria for the case-based examination containing detailed instructions on what is expected for a "pass" and what renders a "fail", authors' English translation.

Appendix 3a: The first version of the case-based examination from "student 1", in its original version in Swedish.

Appendix 3b: The first version of the case-based examination from "student 1", authors' English translation.

Appendix 4a: The first version of the case-based examination from "student 2", in its original version in Swedish.

Appendix 4b: The first version of the case-based examination from "student 2", authors' English translation.

Appendix 5a: The first version of the case-based examination from "student 3", in its original version in Swedish.

Appendix 5b: The first version of the case-based examination from "student 3", authors' English translation.

Appendix 4a: The assessors' comments for "students 1, 2, and 3", in its original version in Swedish.

Appendix 4b: The assessors' comments for "students 1, 2, and 3", authors' English translation.