Problem Domain

The SIBD course project concerns the development of an information system supporting the day-to-day operations of a dental clinic. The relational database associated with this information system aims to offer an all-purpose archive and organization tool for the different types of data generated during clinical practice.

The database should store information regarding the different types of employees of the dental clinic, namely receptionists, nurses/assistants, and doctors. For all three cases, we can use the VAT/NIF or the IBAN number as a unique identifier, and we also need to store the name, birthdate, postal address (including street name, city, and zip code), salary value, and phone number. For doctors, we require additional information, including the specialization (e.g., dento-maxillofacial radiology, oral medicine, pediatric dentistry, oral surgery, etc.), the e-mail address, and a small biographic description.

The dental clinic employs two types of doctors, namely trainees and permanent doctors. For permanent doctors the database should store the number of years they have been practicing. Trainees should, in turn, always be assigned to a permanent doctor, who acts as the supervisor and writes an evaluation report every couple of months. The textual contents of the evaluation report should be stored in the database, together with the corresponding date and a general evaluation score in the range from one to five.

The database should also store information regarding the clients of the clinic. For each client, we should keep the VAT/NIF number, which can be used as a unique identifier, as well as the name, birthdate, gender, postal address (including street name, city, and zip code), age, and phone number.

The receptionists working at the clinic keep appointment records and, for each appointment, we store the date (i.e., day and start time for the appointment), the corresponding client, the doctor, and a small textual description. The clinic can have multiple appointments for the same date, although not with the same doctor. The appointments that go according to plan (i.e., when the client does not miss his/her appointment, appearing at the clinic on the scheduled date) should be recorded in the database as consultations.

For each consultation at the clinic, besides the information associated with the appointment, we should also store information on the nurse(s) that assisted in the consultation (at least one), together with 4 textual attributes corresponding to SOAP notes (i.e., an acronym for Subjective, Objective, Assessment, and Plan):
- Subjective observation: textual summary of client observations, concerns and insights, as well as opinions and hunches from the doctor;
- Objective observation: textual summary of the relevant history, and description for the results from any physical examination;

- Assessment: textual summary for the situation of the client, containing a differential diagnosis list and a prognosis;
- Plan: textual summary of substantive actions and activities, including future diagnostic tests, therapy actions, care recommendations, and recommendations for future appointments and follow-up care.

As hinted by the inclusion of SOAP notes, each encounter with a doctor of the dental clinic may result in a particular diagnosis list (i.e., when specific problems or injuries are detected, the consultation can be associated to one or more diagnostic codes). The diagnostic codes should be standardized (e.g., restricted to a controlled vocabulary such as SNODENT[1]) and stored in the database, through the actual unique code together with a corresponding short description.

The database should be flexible regarding the storage of relations between the different diagnostic codes, considering a general and extensible approach that considers multiple types of relations, and where each diagnostic code can relate to multiple other codes, which in turn can be further related to yet other codes (e.g., the code corresponding to "infection of tooth socket" can be registered as being related to "dental cavity", and also as a specialization of "oral infection" and "infectious disease").

When a consultation is associated to at least one diagnosis, it can be optionally associated with a prescription (i.e., each prescription relates to treating a particular problem or injury). The prescription consists of a set of medications, each described by a name for the active substance and a laboratory/brand. Each medication prescribed within a consultation should be associated to a dosage, and to a small description for the dosage regime (i.e., the schedule of doses, including time between doses and duration of treatment).

A consultation might also involve one or more types of procedures (e.g., tooth extractions, application of dental restoratives, radiography exams, dental chartings, root canal treatments, etc.), each with a complete name and a type (e.g., *maxillary molar periapical radiograph* would be a *radiography exam*). For all procedures made in the context of a consultation, the database should store a small textual description summarizing the actual procedure and/or its outcome.

For procedures of type *dental charting*, the database should store indicators/measurements for the teeth of the client. Teeth are identified according to the Palmer Notation Numbering System[2], specifically through a mouth quadrant and a tooth number. For each tooth, the database should store the gap between the tooth and the gums, in millimetres.

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[1] https://www.ada.org/resources/practice/dental-standards/snodent
[2] https://en.wikipedia.org/wiki/Dental_notation#Palmer_notation

Expected Results

A project report for this first assignment should be submitted to Fénix as a single PDF file, readable with a standard program such as Adobe Reader. The report of your group must include two main results:

- An E-R model describing your proposed database design. Every design decision that can be captured in the E-R model should be represented in the diagram. The E-R notation should be the same as in the slides for the course. You may use a diagram editor, such as Dia or Draw.io, to draw the final E-R model to be included in the report.
- The relational model that is obtained by converting the E-R diagram into a set of tables. Please follow the notation and the conversion rules given in the slides for the course, and do not forget to include integrity constraints such as candidate/primary keys, and foreign keys.

The document cover page should mention the names, student numbers, and group number of its authors. If possible, the E-R diagram should be presented on a single page, and the relational model also on a single separate page. Do not forget to include additional integrity constraints, not captured in the E-R or relational models, separately for each case. You may provide notes explaining the rationale behind non-trivial design decisions.