The SOAP Pattern for Medical Charts

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Abstract
We discuss an analysis pattern that describes some aspects of a patient treatment instance. Each encounter within a medical facility must be documented. Our pattern describes the breakdown of each treatment instance, or chart into categories for a patient stay or visit in a hospital. Our pattern categorizes this information with a methodology many physicians use to divide their notes, known as SOAP (Subjective, Objective, Assessment, Plan). This pattern is an extension of our previous pattern, the Patient Treatment Records Pattern which describes the collection of treatment instances for each patient within a medical group. The SOAP pattern for medical charts is a categorization of the patient treatment instance.

1. Introduction
A medical record could be thought of as a series of dated treatment instances, or encounters. Each encounter is documented on a patient chart. Each documented patient encounter contains dated notes written by physicians, laboratory reports, and letters from consulting physicians. In addition, a patient chart will have vital sign documentation from nurses, imaging reports, specific treatment plans, treatments performed, medications given, assessments of patient condition, etc [Hil98]. Due to the sensitive nature of the medical information, much of this data needs to be organized and categorized to prevent unwanted access to private information by unauthorized personnel. As documented patient information moves from paper based records to digital format, a categorization and organization strategy is key to the success of this transition.

The patient information detailed within each stay at a medical facility needs to be systematically organized. Separation and categorization of this information is crucial not only to provide the best patient care, but also for regulation compliance and protection against liabilities in the possible case of malpractice.

Much of this information within the patient encounter, or treatment instance can be categorized into separate sections. The physicians use a well-known methodology to divide their notes, known as SOAP (**S**ubjective, **O**bjective, **A**ssessment, **P**lan) [Hil98]. This is one way of dividing some of the contents of the encounter.

The SOAP Pattern for Medical Charts describes the organization of this patient treatment information during a patient stay in a hospital. This pattern may be used in combination with the Patient Treatment Record Pattern [Sor04] that describes the organization of the patient record information during a treatment or stay instance of a patient in a hospital.

Figure 1 shows the Use Case diagram that corresponds to some of the typical needs of patient treatment during an encounter and which define the structure of the SOAP pattern for Medical Charts. Each patient has a guardian, a person responsible for patient decisions; it may be the patient herself. Other use cases such as billing that have been left out for simplicity. The actors involved in access to this information include the Administrative clerk, Nurse and Doctor. However, there are specializations of nurses and doctors, including a check in nurse, patient care

nurse, consulting doctors, etc. The doctors and nurses will record details of the patient care. Use cases describing this care include assessing patient status and maintaining progress reports. In addition a doctor will order medical treatments and recommend patient discharge. There are three use cases included when a patient is admitted to a medical facility. 1) The patient or guardian describes why the patient needs treatment (initial complaint) to the administrative clerk. 2) The administrative clerk needs to have all authorizations for treatment and patient privacy disclosures explained (legal authorizations) and signed by the patient or guardian. 3) An explanation of the procedure for patient discharge from the medical facility (discharge summary).

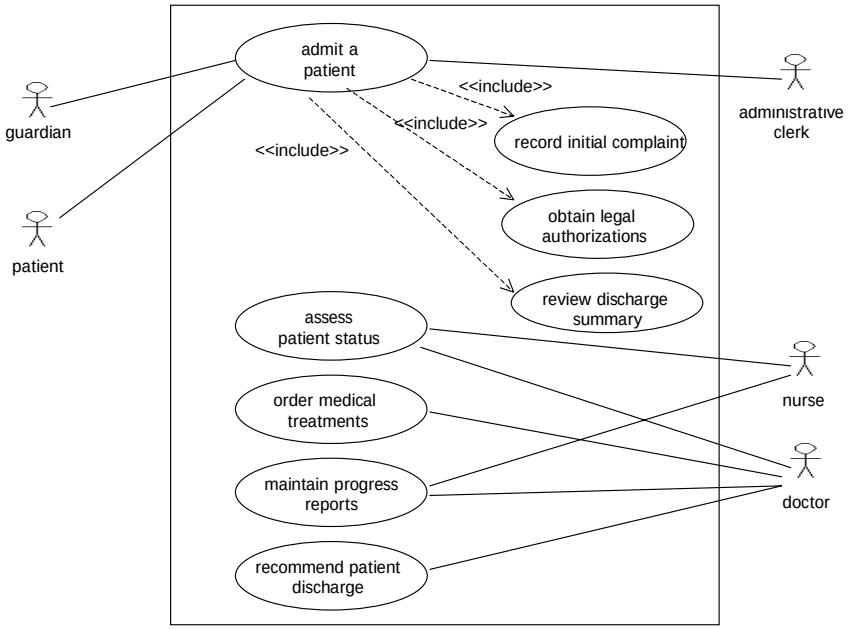

Figure 1 Use Case diagram for Patient Medical Record Contents

The patient can be divided into two types, inpatient or outpatient. An inpatient is usually admitted for care "around the clock" or for surgery, or may be admitted from emergency. Outpatients are generally in the hospital for lab work, x-rays, medications, etc. Their treatment may be initiated by a doctor order [Mil04].

2. The SOAP pattern for Medical Charts

The patient information recorded at each encounter at a medical facility is separated into sections, One section, the physician notes are categorized as SOAP (Subjective, Objective, Assessment, Plan).

3. Example

As an example we will begin with the patient encounter paper record from Boca Raton Community Hospital [Web04], which is broken down fifteen tabs described in Table 1. This is referred to as a chart, and they maintain a separate chart for each encounter. The "d" column in Table 1 describes information currently transcribed to digital format.

	TAB/ section	DETAILS	ACTORS	*d*
	Face Sheet	Initial complaint, basic patient information	**Business office**	**d**
1	**H & P Discharge**	Discharge summary, Discharge instruction sheet, History and Physical exam	**Business office**	
2	**Legal**	Consents, living will, business office paperwork, advance directives, fax confirmations, reguest for patient review of records, HRS forms	**Business office**	
3	**Physician orders**	Trigger point criteria, admission assessment, Braden scale, observations	**Primary physician**	
4	**Progress notes**	Determines discharge plan Add numbers for digitization	**Case manager** **Anyone who dictates notes**	
5	**Consults**	Dictated or handwritten	**Consulting physicians**	**d**
6	**Operative/Pathology**	Anesthesia, pre-operative surgery and nursing assessments, surgical admission instructions, pre-operative patient education, intraoperative record, intraoperative nursing care plan, operative report, pathology report, PACU record, PACU patient care plan	**Physician and nurse**	**d**
7	**EKG/Tele Strips**	EKG, Tele strips, holter monitor report		
8	**Radiology**	Radiology and cardiology reports		**d**
9	**Lab**	Cumulative and miscellaneous labs		**d**
10	**Emergency services**			
11	**Nursing notes**	Admission assessment plan, progress notes, nursing diagnosis categories	**nurse**	
12	**Meds**	Medication administration record	**Physician and nurse**	
13	**Flow Sheets**	Daily assessment sheet, every day	**Physician and nurse**	
14	**Education**	Interdisciplinary patient /family education record		
15	**Miscellaneous**	Respiratory, record from other facilities, anything else that does not have a tab		

Table 1. Medical hospital chart information

This chart is created upon admission to the hospital, whether as an inpatient or outpatient. This hospital is not a member of a group; however, if a patient is not new to the facility there will be a record of previous visits all documented as separate charts. The patient has a patient identification number for his cumulative medical record and is assigned a unique number for each encounter. Upon admission a patient fills out a consent form and his chart may be updated with pertinent information from a previous visit. The patient chart remains with the patient throughout the stay in the hospital. When a patient is discharged from the hospital the chart is added to the medical

record and the medical records department is the custodian of the record. The hospital is currently working on the transition of information from paper-based to digital format.

4. Context

A hospital or any medical institution that treats patients and must maintain detailed patient information.

5. Problem

Maintaining accurate medical record organization is crucial for patient treatment and control of information use. How do we keep accurate and organized records during a patient encounter at a medical facility for treatment?

It is important to describe the information we need to protect. Understanding the structure of the medical record and the organization of the information contained in a patient chart may be used to define access control and to comply with regulations. Additional information in a medical record may include geriatrics, genetic information and mental health treatments.

The possible solution is constrained by the following forces:

- There is a large variety of information used to treat patients; we need a systematic way to organize it.
- Complying with regulations requires a clear separation of specific encounters and actions taken.
- Possible legal aspects require a detailed account of what was done and by whom as part of a treatment.

6. Solution

Maintain a detailed record for each patient encounter organized into categories and sections. The SOAP notation describes the division of each physician's notes into four major categories: **subjective** information, **objective** information, patient **assessment**, and the treatment **plan** [Hil98]. This is generally used by the physicians and in doctors' offices, and mental health facilities etc. The subjective portion contains history and background information. The objective portion is where the physician notates her observations about the patient (i.e. the patient smells of stale alcohol). In addition the details of laboratory work, imaging studies and specialized procedures are generally placed in this section. With the information obtained from the first two sections a physician will be more prepared to make an assessment or diagnosis (category 3) and recommend a treatment plan (category 4). The medical chart may be divided into meaningful sections to control and model access.

Structure

Figure 2 shows a class diagram describing the SOAP structure of the medical record. A unique stay or **TreatmentInstance** for every patient is created upon admission to the hospital. The classes of the medical record as described above include, the **TreatmentInstance, AdministrativeNotes, NursingNotes,** and **PhysicianNotes** broken into **Subjective, Objective, Assessment** and **Plan** divisions. There are overlaps in the information between nurse notes, administrative notes, and physician notes. We have emphasized the SOAP structure as part of physician notes based on the methodology used in practice by many doctors.

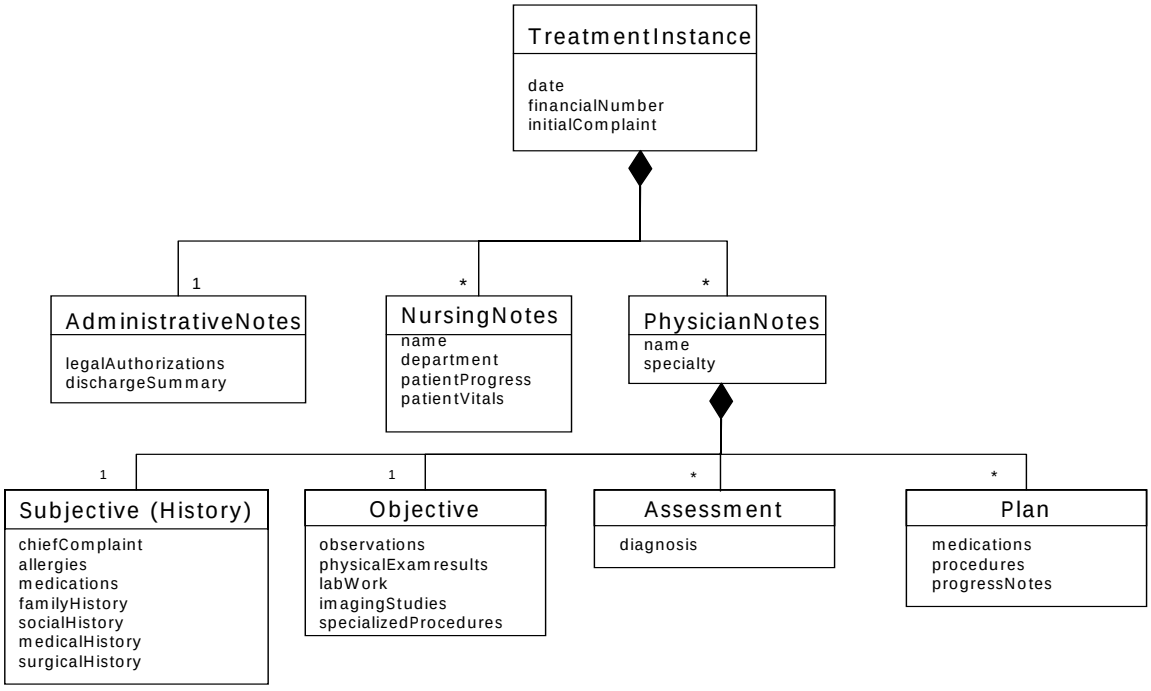

Figure 2 Class diagram SOAP for Medical Charts

Dynamics

A primary doctor determines whether a patient is ready for discharge. The sequence diagram in Figure 3 describes some actions taken by a doctor as she recommends patient discharge. First she will review the latest observations and make final notes. Then she will determine a discharge plan, which may include medication prescriptions. When the decision is made the doctor will notify the administrative clerk. The administrative clerk will review the discharge summary and prepare for patient discharge from the facility.

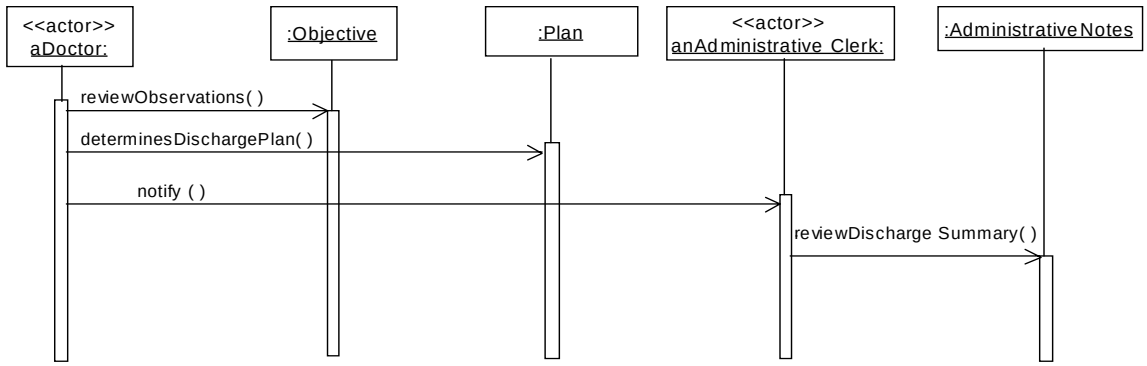

Figure 3 Sequence diagram for recommending patient discharge

7. Example resolved

Table 2 uses the SOAP approach to reorganize the Boca Raton Community Hospital chart information from the paper-based tab format. All the information is separated into sections, the physician notes into SOAP. All types of information correspond to attributes in a class. The structure of the medical facility will determine any overlap of the nurse notes into the SOAP categories. Our emphases is on private patient information documented by patient physician, not the medical facility nurse team.

SECTION	INFORMATION	DETAILS	ACTOR ACCESS
AdministrativeNotes	Face Sheet	Initial complaint, basic patient information	AdministrativeClerk
AdministrativeNotes	H & P Discharge	Discharge summary, Discharge instruction sheet, History and Physical exam	AdministrativeClerk
AdministrativeNotes	Legal	Consents, living will, business office paperwork, advance directives, fax confirmations, reguest for patient review of records, HRS forms	AdministrativeClerk
AdministrativeNotes	Education	Interdisciplinary patient /family education record	Doctor Nurse
NurseNotes	Nursing notes	Admission assessment plan, progress notes, nursing diagnosis categories	Nurse Doctor
Subjective	Miscellaneous	Respiratory, record from other facilities, anything else that does not have a tab	Doctor
Subjective	Emergency services		Doctor Nurse
Objective	Operative/Pathology	Anesthesia, pre-operative surgery and nursing assessments, surgical admission instructions, pre-operative patient education, intraoperative record, intraoperative nursing care plan, operative report, pathology report, PACU record, PACU patient care plan	Doctor Nurse
Objective	EKG/Tele Strips	EKG, Tele strips, holter monitor report	Doctor Nurse
Objective	Radiology	Radiology and cardiology reports	Doctor Nurse
Objective	Lab	Cumulative and miscellaneous labs	Doctor Nurse
Objective	Physician notes	Trigger point criteria, admission assessment, Braden scale, observations	Doctor
Assessment	Consults	Dictated or handwritten	Doctor
Assessment NurseNotes	Flow Sheets	Daily assessment sheet, every day	Doctor Nurse
Plan	Meds	Medication administration record	Doctor Nurse
Plan	ProgressNotes	Determines discharge plan	Doctor

8. Variants

Patient Treatment Record and SOAP pattern for Medical Charts. The SOAP pattern for Medical Charts can be combined with the Patient Treatment Record Pattern. This is a Semantic Analysis Pattern (SAP) [Fer00], a larger pattern corresponding to several use cases. By breaking the patient chart into sections it is possible to analyze who has the right to use each part of the chart. Defining relationships between the users and the chart sections enhances the ability to define access rights. Figure 4 shows the combination of the Patient Treatment Record pattern and the SOAP pattern for Medical Charts.

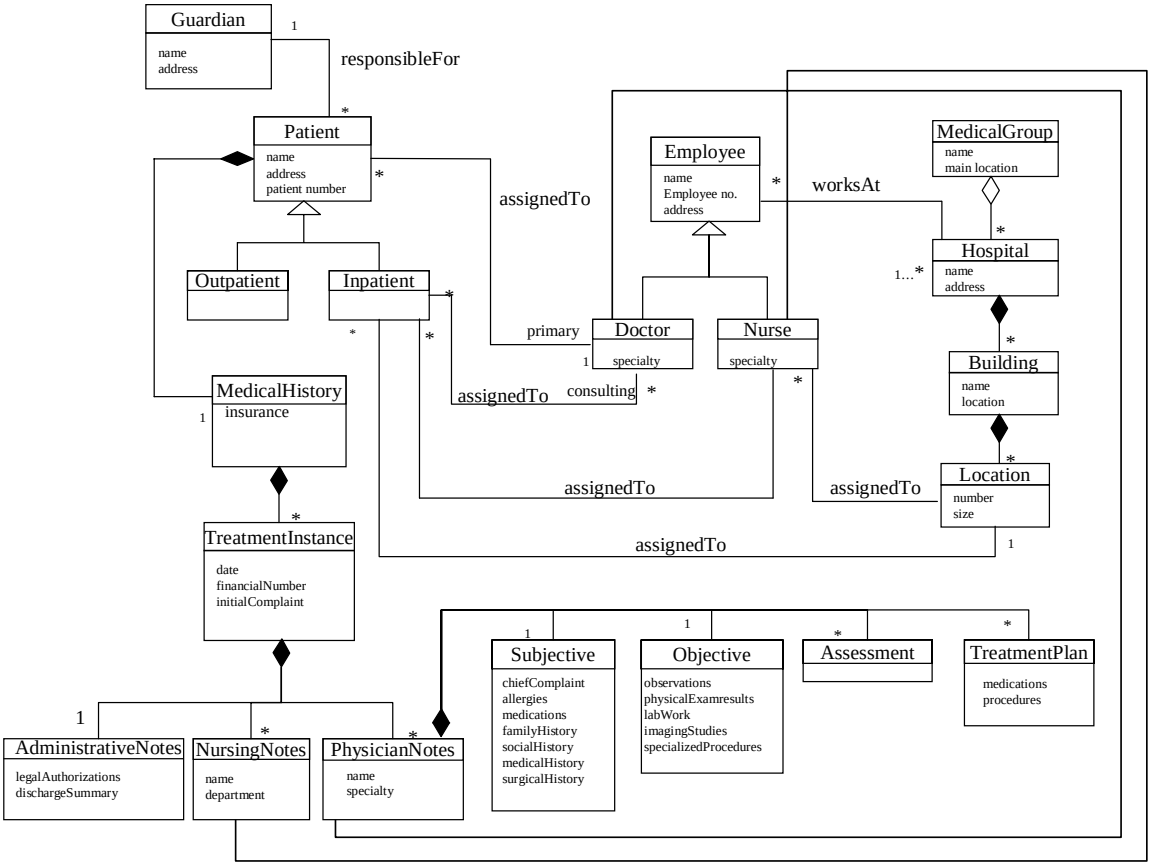

Figure 4 Class diagram Patient Treatment Record with SOAP for Medical Charts

9. Known uses

Clinic Medical Billing Software [Cmb] uses the SOAP notes structure in their medical billing software. SOAPware [Soap], an electronic medical record that is designed for clinics uses SOAP note generation to document patient encounters. Many doctor offices use this type of software, including Boca General and Family Medicine in Boca Raton, FL.

10. Consequences

The SOAP Pattern for Medical Charts has the following advantages:

- Provides a logical and systematic way of keeping patient treatment information.

- The separation of different aspects allows the medical facility to check for compliance with regulations.
- The separation of doctor and nurse annotations allows the medical facility to determine liability in cases of malpractice.

The SOAP Pattern for Medical Charts has the following liabilities:

- The structure may be confusing to other medical facility workers, e.g. lab, pharmacy.
- There may be some redundancy of information between the doctor and nurse annotations.

11. Related patterns

Patient Treatment Record Pattern [Sor04]. This pattern complements the SOAP Pattern for Medical Charts in that it describes the structure of patient records and the process of creating and maintaining them for a stay or treatment in a hospital.

M. Fowler [Fow97] and J. Yoder [Yod01] have produced analysis patterns about aspects of medical histories, including observations of the status of a patient (part of the Objective class in our pattern). .

Repair Pattern – This pattern describes the repair of computers or instruments at a repair shop [Fer00, Fer01]. There is a clear analogy between repairing devices and "repairing" people.

SiGCli: A Pattern Language for Rehabilitation Clinics Management-this pattern language describes nine patterns used in combination for patient information record, care, and billing in rehabilitation clinics [Paz04].

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