

Diagnosis and Problem List

Requirements in outpatient care



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Table of contents

1	General information3
1.1	Introduction
1.2	2 Situation
1.3	Methodology of medical documentation
1.4	4 Purpose
1.5	5 Limitations
2	Fundamentals4
2.1	Treatment units
2.2	Problems and diagnoses5
2.3	B Episode of Care
3	Requirements9
3.1	Basic element - The health problem9
3.2	2 Linear lists
3.3	<i>Diagnosis and problem list14</i>
3.4	Context-related diagnosis and problem list16
3.5	5 The past medical history
4	Diagnosis and problem list examples19
4.1	Medical Information System curaMED19
4.2	2 Medical Information System triaMED [©]
5	Directories24
5.1	List of illustrations
5.2	2 List of tables
6	Glossary and list of abbreviations24
6.1	Glossary
6.2	25 Abbreviations



1 General information

1.1 Introduction

The diagnosis and problem list is a central element of medical documentation. Depending on the methodology or documentation guidelines used within an organization, there are different requirements for its representation in a medical information system.

1.2 Situation

In outpatient medicine, the care of a patient takes place over a long period of time, in some cases over a lifetime. Consequently, a patient-centered representation of medical data has become established within medical information systems.

The temporal dimension places specific requirements on the diagnosis and problem list. Additional aspects must be considered for the emerging cross-institutional patient-centered diagnosis and problem list.

1.3 Methodology of medical documentation

In Swiss outpatient care, different methods are used for medical documentation:

- Episode-oriented approach according to Solon et al.¹
- Problem-oriented approach according to Weed²
- Consultation-oriented approach
- Document-oriented approach

The episode-oriented electronic health record according to Solon is a further development of Weed's methodology and imposes the highest requirements on modeling a medical information system. In practical implementation, it has been shown that the episode concept allows the seamless use of the other methods within the same medical information system. Consequently, the problem-oriented, consultation-oriented, and document-oriented methodologies can be considered simplified variants of the episode-oriented methodology.

This document outlines the requirements for the diagnosis and problem list in the context of the episode-oriented methodology.

1.4 Purpose

This document describes the basic requirements for the *diagnosis and problem list* in outpatient patient care.

It provides a comprehensive overview of the requirements in the ambulatory setting for modeling the *diagnosis and problem list*.

1.5 Limitations

This is the first version of the compiled diagnosis and problem list requirements. As a result, the textual description is relatively brief. Much detail can be found in the figures and tables.

 ¹ SOLON, Jerry A., FEENEY, John J., JONES, Sarah H., RIGG, Robert D. and SHEPS, Cecil G. Delineating episodes of medical care. American Journal of Public Health and the Nations Health. [online]. 1967, 57(3), 401-408.
 ² WEED L. L. Medical records that quide and teach. The New England journal of medicine. 1968, vol. 278, no. 11.

 $^{^2}$ WEED, L. L. Medical records that guide and teach. The New England journal of medicine, 1968, vol. 278, no. 11, pp. 593-600.



The description of the requirements has not yet been aligned with the modeling of standards. Primarily, aspects from existing and planned medical information systems in the outpatient sector have been considered.

In addition, the representation of health problems in the International Patient Summary (IPS) has not been analyzed in detail and is not yet included in this document.

The requirements, however, have been formulated with a broad scope. Depending on implementation and use in individual medical information systems or apps, fewer elements may be required.

The underlying episode-oriented methodology of medical documentation with the concept of Episodes of Care is only briefly explained as necessary for the purpose of this document.

The list of attributes and values for health problems and metadata does not take into account information technology aspects such as normalization, cardinality, and mandatory fields.

2 Fundamentals

2.1 Treatment units

The care of a patient by service providers includes various treatment units, depending on how the boundaries are defined:

- In organizational terms, contact takes place between a patient and a service provider
- In terms of time, care covers a specific period, such as a day, week, month, or year
- **In terms of content**, an episode includes one or more contacts of the patient with one or more healthcare providers for the treatment of a specific medical health problem

			Boundary setting	Treatment unit	Description
		Contact	Organizational	Contact	Individual contact with a service provider, categorized by type of stay: outpatient / day patient / inpatient
Period		Contact	Temporal	Period	All treatments within a certain period: day / week / year
	-		Content-related	Episode	Multiple contacts with one or more healthcare providers for the treatment of a health problem
		Contact		Treatment section	Sections in the course of care with different care goals: - Initial contact - Prevention - Acute treatment - Rehabilitation - Care / nursing - Treatment break
		Contact		Treatment phase	Elements of a treatment section (with different care methodologies): - Diagnostics - Therapy (invasive, conservative, ICU stay) - Follow-up care - Waiting period

Figure 1- Treatment units for patient care³

³ https://fischer-zim.ch/auszuege-pcs-buch/Strukturierung-von-Behandlungsverlaeufen-9701.htm



2.2 Problems and diagnoses

2.2.1 Problem solving

The relationship between patient and physician is asymmetrical, with each having their own role. The patient has one or more health problems and seeks the medical professional's help in the hope that these problems will be resolved and lead to recovery.

The physician's first task is to identify and structure the patient's problems. The physician then forms working hypotheses based on his knowledge, makes diagnostic or therapeutic decisions, and carries them out. Finally, the physician monitors progress, formulates new hypotheses as needed, and makes new decisions. This process is iterative and imperfect, without ultimate certainty as long as the patient is alive. The patient is therefore the *bearer of the problem*, and the physician is the *solver of the problem* - to the best of his knowledge and belief.⁴

2.2.2 Diagnoses, problems

All patient information is summarized into patterns and categorized as problems in the sense of health problems. During the diagnostic process, this information is refined into actual diagnoses, while other issues remain categorized as problems.⁴

Diagnoses and problems are not the same thing. At the beginning of the diagnostic process, a problem may be simple patient-reported information, such as a cough for three weeks or a fever of 39°C, an unexpected finding, such as a radiological lung shadow or a sonographic liver lesion, or an uninterpreted laboratory finding such as hypercalcemia or hyperbilirubinemia. During the diagnostic process, these findings are refined into actual diagnoses, while others remain as problems.

Medical diagnoses classify pathological processes using scientific terms. In Switzerland, the International Classification of Diseases (ICD) of the World Health Organization (WHO) is commonly used. In primary care, the International Classification of Primary Care (ICPC-2) of WONCA is widely used.

Specification	Values
Localization	- left
	- right
	- bilateral
	- Anatomical term
Condition	 Suspected diagnosis
	- Confirmed diagnosis
	- Excluded diagnosis
Level of Certainty	 Anamnestically confirmed
	- Clinically proven
	 Radiologically confirmed
	- Histologically confirmed
Timing information	- Acute
	- Chronic
Follow-up Event	- Complication
	- Recurrence
Start Date	- Initial Diagnosis (date of diagnosis)
Status	 Active (problem or diagnosis requires diagnostic or therapautic intervention)
	therapeutic intervention)

Additional information is required for a diagnosis and, in some cases for problems, as summarized in the following table:

⁴ Arthur Uehlinger, former head physician at Schaffhausen Cantonal Hospital



	 Inactive (problem or diagnosis is not being processed and is dormant) Closed
Goal	 Treatment goal agreed upon by physician and patient for this problem or diagnosis. Primarily used for chronic conditions. Timeframe for achieving the goal

Table 1- Additional Diagnosis information

2.2.3 Lifecycle of a health problem

The name and type of a patient's health problem changes over time during the patient's care. The problem is recorded and may be renamed or specified as it progresses. During the diagnostic process, the clinician makes a suspected diagnosis and reformulates the problem accordingly. When a suspected diagnosis is confirmed, it is renamed as a diagnosis. Based on the therapy performed, the health problem is resolved, and the diagnosis is closed. Important closed diagnoses are added to the *past history*.

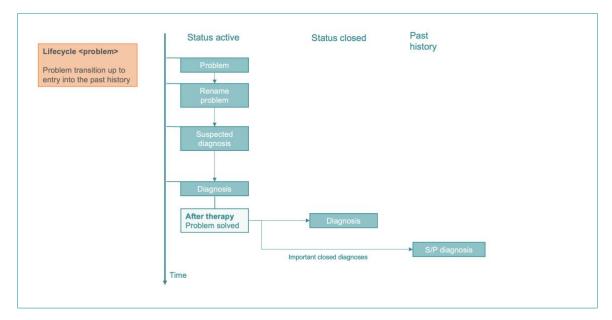


Figure 2- Lifecycle of a health problem from the problem to the past history

For example, a patient presents with abdominal pain that progresses to acute abdomen. The physician suspects cholecystitis and orders laboratory tests and an ultrasound. The diagnosis of cholecystitis is confirmed. The patient is treated, the health problem is resolved, and the diagnosis is closed. Because this is an important closed diagnosis, it is recorded in the past history as *S/P cholecystitis*.

2.2.4 Problem list

In 1968, the physician Lawrence Leonard Weed published an article in the *New England Journal of Medicine* in which he introduced his methodology for improving the medical record.⁵ He replaced the structuring of the medical record according to various sources, such as x-ray findings, laboratory results, and physician notes with a structure that focused on a defined list

⁵ WEED, L. L. Medical records that guide and teach. The New England journal of medicine, 1968, vol. 278, no. 11, pp. 593-600.



of a patient's medical problems. Organizing patient information around specific problems is intended to improve overview, clinical decision making, and medical education.

The central element of Weed's Problem-Oriented Medical Record (POMR) is the *problem list*. The patient's current and past diagnoses and problems are arranged in a hierarchical list in descending order of importance to the patient.

In everyday practice, problems and diagnoses are often linked or interrelated in complex ways. Therefore, diagnoses and problems are organized and numbered hierarchically according to their importance to the patient. The grouping is based on medical aspects, with a main diagnosis or overarching term and related problems and diagnoses listed below.

In addition, *primary data* can be added to the hierarchical problem list for each diagnosis or problem. Primary data includes relevant anamnestic, clinical, or additional information with associated keywords, measurements, and links to other items in the structured medical record.

The hierarchical, sequentially numbered problem list of all the patient's current and past health problems provides a clear index to the patient's medical record. The problem list proposed by Weed is now commonly referred to as the *diagnosis and problem list*.

Example diagnosis and problem list 1. Urinary tract infection (22/03/2024) 2. Coronary artery disease with/without Arterial hypertension (ID 2009) -Heart failure S/P myocardial infarction (2015) 3. Diabetes mellitus type 2 (ID 2007) Polyneuropathy (ID 2014) Nephropathy (ID 2017) HbA1c 23.02.2024: 6.4% 4. Obesity WHO grade II Initial BMI 35.9 kg/m2 Started Liraglutide therapy 03.04.2022 BMI 16.05.2024: 31.3. kg/m2 5. Husband in need of care 6. S/P cholecystectomy (1988) 7. S/P appendectomy (1965)

Figure 3 - An example of a simple diagnosis and problem list

2.3 Episode of Care

2.3.1 Concept

The problem-oriented management of medical records according to Weed reaches its limits in certain areas. In the case of long medical records, the user loses the overview, and the requirements of managed care cannot be satisfactorily met. In order to be able to compare the cost and quality of patient treatment, it must be possible to structure the data in the electronic medical record completely in terms of organization, time and content.

It must also be possible to differentiate between treatment cases in terms of commercial aspects within the practice, and the episode of illness as it occurs in the patient, from the beginning to the healing of a health problem.



The *episode of care* has been proposed by health services researchers as an appropriate unit for measuring cost-effectiveness and quality. The theoretical concept of *episodes of care* was published by Jerry A. Solon and colleagues in the American Journal of Public Health in 1967.⁶

The episode of care is the period of time during which a health problem persists, measured from the first to the last contact between the patient and the healthcare providers. An episode includes all information about a single health problem that is recorded in the medical record over a defined period of time for all contacts. An episode of care covers a patient's health problem from its beginning to its resolution. Documentation within the single contact is done per episode according to the SOAP principle. Exacerbations and complications of an episode are presented in separate episodes.

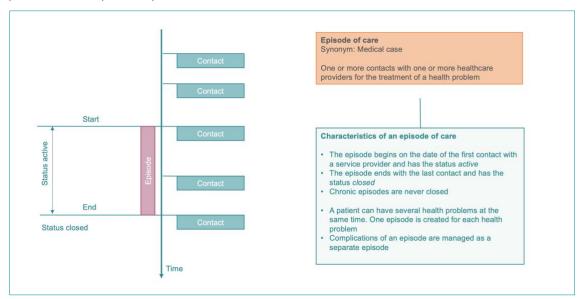
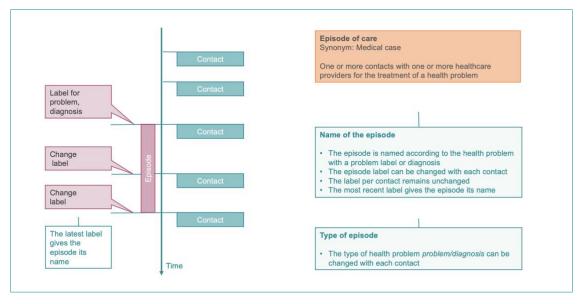


Figure 4 – Definition of 'episode of care'

2.3.2 Name of the episode



⁶ SOLON, Jerry A., FEENEY, John J., JONES, Sarah H., RIGG, Robert D. and SHEPS, Cecil G. Delineating episodes of medical care. American Journal of Public Health and the Nations Health. [online]. 1967, 57(3), 401-408.



Figure 5- Naming of an episode of care

When a new health problem arises, an episode of care is created at that contact with a problem or diagnosis as its name. For each subsequent contact, the episode can be renamed based on the diagnostic or therapeutic process. The label entered for each contact must be retained so that the chronological display of contacts always shows the name that was valid at that time. This allows you to see the progress and transitions from contact to contact. The episode of care, as described by the World Organization of Family Doctors (WONCA), is shown below with an example:

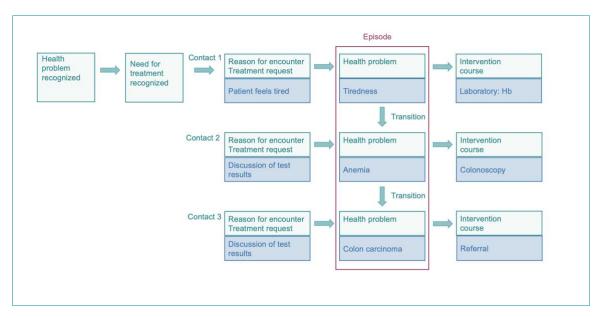


Figure 6 - WONCA - Episode of care with example

3 Requirements

Based on the principles described above, the requirements for the *diagnosis and problem list* within an episode-oriented medical record can be defined.

3.1 Basic element - The health problem

The smallest logical information unit in the diagnosis and problem list is an individual *health problem*, which corresponds to an *episode* in the context of the *Episode of Care*.

During treatment, a health problem may be renamed several times, depending on the progress of diagnosis and treatment. It may evolve into a suspected diagnosis, be confirmed later as a diagnosis, or remain a problem.

A diagnosis can be either acute or chronic. Once a diagnosis has been successfully treated, the health problem is closed. Similarly, a problem that has been solved can also become a closed problem.

All relevant closed diagnoses together form part of the past medical history. Accordingly, the past medical history consists of closed health problems from the patient's own documentation and the anamnestic information on important illnesses, accidents, maternities, and surgical procedures.



In the episode-oriented methodology, a complication or recurrence of a health problem is recorded and managed as a separate episode.

With a few exceptions, a closed health problem remains closed forever and should not be reactivated, i.e. set to *acute*. If the same health problem occurs again, a new episode must be created.

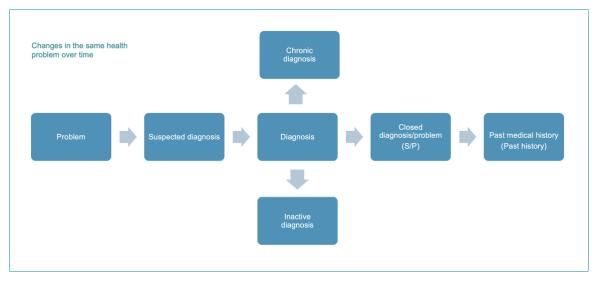


Figure 7- Health problem - Lifecycle during the course of the treatment

3.1.1 Attributes for a Health Problem (Episode)

Depending on the clinical situation and the status in the lifecycle of the health problem, different attributes are required for the health problem. Some attributes tend to be static, while others are updated each time the health problem is modified.

Versioning and maintaining links to the Electronic Medical Record (EMR) is essential for mapping the episode-oriented electronic medical record. At any point in time (contact), it must be possible to see what the health problem looked like at that time in the electronic health record.

Attribute	Values	Explanations, comments				
Туре	ProblemDiagnosis	see lifecycle of health problem				
Subtype	Main problem/diagnosisSecondary problem/diagnosis					
Status	ActiveInactiveClosed	Active = problem or diagnosis requires diagnostic or therapeutic intervention. Inactive= Problem or diagnosis is not being addressed and is dormant.				
Condition	 Suspected diagnosis Confirmed diagnosis Excluded diagnosis 	Type = Diagnosis				
Progression	Acute Chronic	Chronic = long-term diagnosis				
Name - Prefix	 Blank Suspicion of Status after (S/N) 	This allows the name to be automatically set for the display according to the lifecycle of the health problem without the need for the user to change the name.				



Name	free text and/orSelection from clinical catalog	Original text ICD, ICPC not sufficient as name.
		Name must be historicized. The most recent name gives the episode its name.
		For efficient work, free text input with semantic reference to the code should be possible.
Localization	 irrelevant left right on both sides 	
Comments	anatomical term free text	Optional
Coding	Nomenclature	ICD10, ICPC-2, SNOMED-CT etc.
County	Codes	
Invoice Code	NomenclatureTI code	TI-code for outpatient billing in TARMED or TARDOC. Required for process automation in the information system.
Start Date	 date Accuracy Exact 	Date of the start time of the problem, date of diagnosis (initial diagnosis or ID for short).
	 To the month Approximately to the month To the year Approximately to the year 	Exact(day.month.year)Exact month:(month.year)Approximate month:(approx.month.year)Exact year:Exact year:(year)Approximate year:(approx. year)
Start Date Age	• Age	Age of the patient at start time, calculated based on the date of birth
Security Level	 Unknown Anamnestically confirmed Clinically confirmed Radiologically confirmed Histologically confirmed 	Primarily used when Type=Diagnosis
Event Type	 Illness Accident Maternity 	When health problems are to be automatically transferred to the past hostory or for process automation in accounting. Maternity = pregnancies, abortions, births
Follow-up Event	NoneComplicationRecurrence	With link to the original health problem. Necessary to map total cost and quality
Past History	Yes No	Indicates whether a closed health problem becomes part of the past history
Treatment goal	 Definition Timeframe	The treatment goal is agreed between the doctor and patient. The period required to achieve the
		goal is agreed between the doctor and patient.



Table 2- Attributes of health problem (episode)

3.1.2 Metadata for a Health Problem (Episode)

Depending on the status in the lifecycle of the health problem, different metadata are required for the health problem. Some metadata tends to be static, while others are updated each time the health problem is modified. Versioning and maintaining links to the Electronic Medical Record (EMR) is required to map the episode-oriented electronic medical record.

Attribute	Values	Explanations, comments
First Author	ID creator	ID = GLN, UID etc.
	 Title, last name, first name ID Organization/Institution Name of the 	Healthcare professional who created the health problem.
	organization/institution	Organization/institution where the healthcare professional worked at the time.
Recorder	ID creator	ID = GLN, UID etc.
	 Title, last name, first name ID Organization/Institution Name of organization/institution 	Healthcare professional who recorded or arranged for this version to be recorded.
		Organization/institution where the healthcare professional worked at the time.
		In Switzerland, a distinction is made between the attending physician and the responsible physician. This distinction may need to be considered when automating billing processes.
User	ID user	ID = GLN, UID etc.
	 Last name, first name ID Organization/Institution Name of organization/institution 	User who entered or edited the health problem. This can be the physician or, for example, a medical practice assistant (MPA) making a preliminary entry on behalf of the physician.
First contact	Date, Time	Contact = Occasion, Encounter
	Link to contact	Contact whose documentation in the EMR led to the initial recording of the health problem
Last contact	Date, Time	Contact = Consultation, Encounter
	Link to contact	Contact where medical information on this health problem was last documented in the EMR
Diagnostician	ID creator	ID = GLN, UID etc.
	 Title, last name, first name ID Organization/Institution Name of organization/institution 	Healthcare professional who made the diagnosis.
Validations	ID	ID = GLN, UID etc.
	Title, last name, first nameTiming	For example, the first author is an assistant physician. The attending physician validates the recorded health



		problem. The medical director performs the final validation.
Source	 Manual Interface Migration 	 Manual = user at workstation. Interface = automated entry into the EMR via an API. Migration = entry into the current EMR as part of a data migration.
Documentation Timestamp	DateTime	Transaction date/time: Date/time when a version is saved in the Medical Record (EMR)
Versioning	Version numberLink to previous entry	Essential for tracking changes

Table 3- Attributes Metadata on the health problem (episode)

3.2 Linear lists

Linear lists can be created automatically based on the stored individual health problems (episodes) and their attributes:

- Episode list
- Diagnosis list
- Problem list
- Personal medical history (past history)

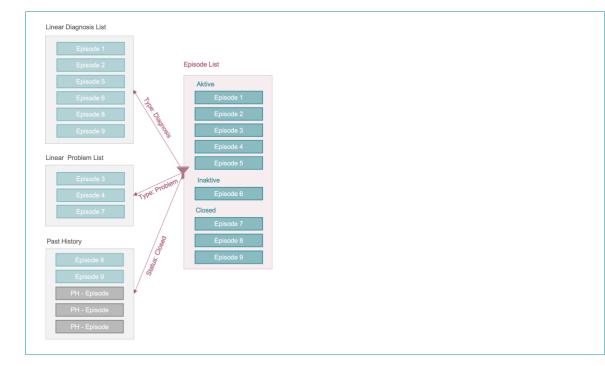


Figure 8- Health problems in list form

3.2.1 Episode list

The sum of all health problems results in a linear list of episodes, i.e. an *episode list*. The display can be grouped by further attributes, e.g. active, inactive and closed episodes, or filtered, e.g. only active episodes. Grouping active episodes into chronic and acute categories can also be helpful.



In patient care, the list of active episodes represents the health problems that the healthcare professional is diagnosing or treating. In this sense, it can be used to create an "agenda" for the encounter right out of the box.

3.2.2 Diagnosis list

A filter on the "Type" attribute (diagnosis, problem) of the episode list can be used to create a linear list of diagnoses. This list can be grouped, sorted, and further filtered according to various criteria.

3.2.3 Problem list

A filter on the "Type" attribute (diagnosis, problem) of the episode list can be used to create a linear list of problems. This list can be grouped, sorted, and further filtered according to various criteria.

3.2.4 Past history

A value can be set for closed health problems to indicate whether they are part of the past history or not. This allows closed health problems (episodes) to be displayed or automatically transferred to the past history. The past history itself can be grouped into illnesses or accidents using the *Event* attribute, or displayed chronologically using the date.

The more detailed considerations regarding the *past history* are described in a separate chapter below.

3.2.5 Persistence of user settings

It should be possible to persist the grouping, filtering, and sorting of a patient's episode list, diagnosis list, and problem list as set by the user or a user group.

3.3 Diagnosis and problem list

3.3.1 Overview

The *diagnosis and problem list* is not just a simple list but a structured hierarchy that integrates links to related diagnoses and problems (episodes) and other entries in the medical record.



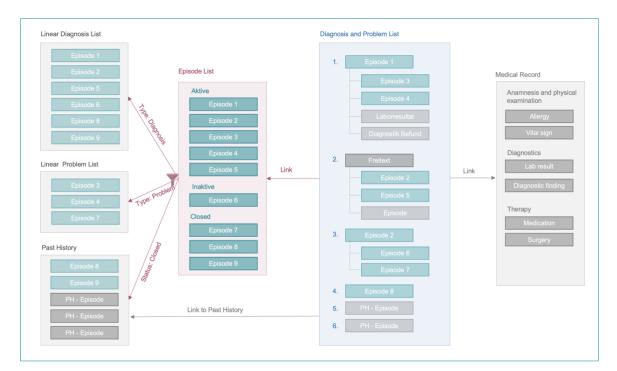


Figure 9- Diagnosis and Problem List in a linked tree

3.3.2 Hierarchical grouping

Problems and diagnoses are often related or interconnected in complex ways. Therefore, diagnoses and problems are hierarchically organized and numbered according to their importance to the patient. The grouping is based on medical aspects, with main diagnosis or superordinate term and the associated problems and diagnoses indented.

In addition, the *primary data* can be added to the hierarchical problem list for each diagnosis or problem. The primary data includes relevant anamnestic, clinical, and additional information with associated keywords, measurements, and links to other items in the structured medical record.

3.3.3 Tree structure

The diagnosis and problem list is a user-generated grouping of health problems (episodes) in a hierarchical data structure based on clinical criteria.

The diagnosis and problem list is therefore a tree structure with main nodes, sub nodes and end nodes, with each node serving primarily as a link to other medical information in the electronic medical record (EMR

Each individual node is one of the following:

- A link to a health problem (episode)
- A link to past history record
- A link to a structured medical record entry, such as anamnesis, physical examination, vital signs, allergies, laboratory values, brief diagnostic findings, medications, minor procedures, or surgeries
- Free text, entered by the user

In practice, two to three hierarchies are used.



The main nodes are numbered consecutively. When inserting new main nodes or rearranging the order of the existing main nodes, all main nodes are automatically renumbered consecutively, starting with 1. Sub nodes and end nodes are not numbered, but are visually linked.

The individual nodes can be freely moved by the user. When a node is moved, all its child nodes are automatically moved as well. This means that if a parent node is moved within the top level, all of its child nodes are automatically moved as well. As a result, an entire group can be moved within the top level, which users often do when reorganizing the main problems.

For links to structured information from the Electronic Medical Record (EMR), such as BMI, it must be possible to specify whether the link is a static link that displays the content at the time the link was created, or a dynamic link that always displays the current value.

3.3.4 Editing nodes

The node in the diagnosis and problem list is a link to a health problem (episode) or a structured information unit from the Electronic Medical Record (EMR). If the information displayed on a node is to be edited, this must be done on the linked item.

3.3.5 Remove

If desired, the user can remove a node. This removes the link from the list, while the linked item remains unchanged in the Electronic Medical Record (EMR).

3.3.6 History

Every change in the diagnosis and problem list tree structure should be logged. It should be possible to reconstruct the diagnosis and problem list for any point in time in the past.

3.3.7 Representation

Health problems can be represented in a medical information system as follows:

[Prefix] [Name] [Localization] [(Date)] [Coding]. For diagnoses, the prefix [ID] or [Initial Diagnosis] or [first diagnosed] may be added to the date.

Examples:

[Suspected] [humerus fracture] [left] [(14.01.2025),] [S52.50] \rightarrow Suspected humerus fracture left (14.01.2025), S52.50

[Null] [Diabetes mellitus type 2] [Null] [(Initial Diagnosis 2004),] [E11.90] \rightarrow Diabetes mellitus type 2 (Initial Diagnosis 2004), E11.90

 \rightarrow Diabetes mellitus type 2 (Initial Diagnosis 2004), LII

 \rightarrow Diabetes mellitus type 2 (ID 2004), E11.90

3.4 Context-related diagnosis and problem list

According to the patient-centered electronic medical record (EMR), there is a master diagnosis and problem list for each patient that reflects the grouping and prioritization of all diagnoses and problems from the patient's perspective.

However, in daily clinical practice, different versions of the diagnosis and problem list are required depending on the context:

- Specialist diagnosis and problem list (custom sorting, subset)
- Specific forms, checklists, and guidelines
- Reports, referrals



Accordingly, alternative sort sequences, groupings, or subsets are derived and persisted based on the master diagnosis and problem list. See the explanations in "*Defining The Contextual Problem List*"⁷

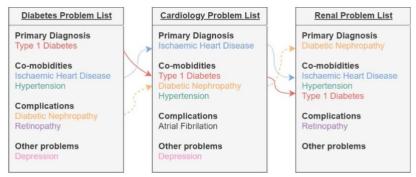


Figure 1. Shared problem records within three contextual problem lists.

In the medical information system, it must be possible to manage additional diagnosis and problem lists per specialty or organizational unit as a subset of the master list.

Report templates used for the automated generation of medical reports require different representations and selections of diagnosis and problem lists depending on the report type.

For diagnosis or problem specific forms, only the items relevant to that diagnosis or problem should be displayed. For example, in the case of a diabetes monitor.

3.5 The past medical history

The past medical history, or simply past history, includes the patient's relevant past illnesses, accidents, maternities, and surgeries. As listed in the lifecycle of a health problem, a relevant closed health problem (episode) is part of the past history. The past history consists of:

- Anamnestically recorded and documented past illnesses and accidents
- Anamnestically recorded and documented past surgeries
- Health problems recorded and closed in the organization's medical information system (EMR)
- Surgical procedures documented in the organization's medical information system (EMR)

The past medical history can be modeled in a number of ways – either as a completely separate entity, or as a list derived from existing entries in the medical record, formed from closed health problems and surgical procedures.

With a completely separate past medical history entity, closed health problems and surgical procedures must be redundantly recreated.

In the case of a list derived from existing records, illnesses and accidents recorded in the past history must be directly documented as closed health problems.

There are advantages and disadvantages to both approaches. Typically, much of the past history is recorded in the diagnosis and problem list, making the second approach more advantageous. In particular, the links between the health problem and the rest of the Electronic Medical Record (EMR) are directly preserved. For example, all SOAP entries for the health problem remain accessible in the past history.

⁷ Meredith, J., McNicoll, I., Whitehead, N., & Ademoye, K. (2020). Defining the Contextual Problem List. In L. B. Pape-Haugaard, C. Lovis, M. Cort, P. Weber, & S. K. Andersen (Eds.), Digital Personalised Health and Medicine (pp. 567-571). IOS Press. https://doi.org/10.3233/SHTI200224



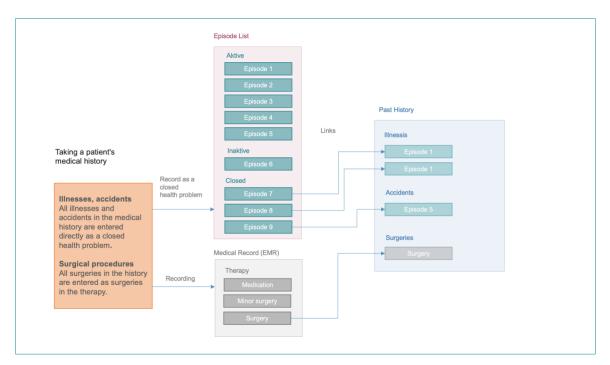


Figure 10- Past history with links to health problems and surgical procedures



4 Diagnosis and problem list examples

Examples from two ambulatory health medical information systems are included to illustrate specific aspects.

4.1 Medical Information System curaMED⁸

Health problems can be displayed on a medical dashboard in different lists, such as a linear diagnosis list, a linear problem list, a linear past history list, and a hierarchical diagnosis and problem list:

cur	ЭМЕД 🕯 НОМЕ	🗄 AGENDA	🌡 PATIENTEN	ABRECHNUNG	🔂 ARBEITSN	IITTEL 📮 PRAXISADMINISTRATI	ION		9	7 ZH - Standort Zürich	Messeri	i Jean-Pierre 🔻	?
ø	i Dossier: Zbinden	Anita 🔹	KST							Patientendaten	Dossier	Dokumente & N	achrichter
۹	25.12.1944 (80 Jahre 8001 Zürich Patienten-Nr.: 8	0	Übersicht Konsult	tationen Diagnosen & Pro	bleme Medikam	ente Anamnese Fragenkataloge Vita	alwerte Laborwerte	Diagnostik Arbeitsunfähigkeit Validierunger	Bilder				
P	Allgemein	Problemliste											*
•	Angemen		Problemliste	2	×	Diagnosen	•	Medikamente - Verordnungen	•	Letzte Laborwert	e		
9	🔴 🔺 🖩 🤤 мс	🔮 🤣 🖈	01 Radiusfraktu	ur loco classico rechts (30.10.2	2022)	Arterielle Hypertonie	2009	ASPIRIN CARDIO Filmtabl 100 mg (1-0-0-0)		28.03.2022 K			
ø	Aliergie Aminopenicillin-/Aminocephalospor					Diabetes mellitus Typ 2	2007	TORASEMID Spirig HC Tabl 5 mg (1-0-0-0)		22.03.2022 REPPDF, S	Serothek, C-re	aktives Protein, Häm	10
	Diagnose	ran whier gie	02 Koronare He Arterielle	erzkrankheit • Hypertonie (Oktober 2009)		Nephropathie	2014	VALSARTAN Sandoz Filmtabi 160 mg (1-0-0-0)		21.09.2021 HGB, HCT,	, CRP		
Ø	Diabetes mellitus Typ 2		- Herzinsiff			Polyneuropathie	2017	CRESTOR Filmtabl 20 mg (1-0-0-0)					
	KVG / Komplexer Patient (Auswertung) ja	A	St. nach N	Myocardinfarkt (2015)		Adipositas		METFORMIN Mepha Filmtabl 1000 mg (1-1-1-0)					
P	Dokument Patienterwerfuegung Zbinden Anita	a 1944		Hlitus Typ 2 (2007)		Herzrhythmusstörung	2023	OZEMPIC FixDose 4 mg/3ml (1 mg/Dosis) (0-0-0-	0)				
8	Allergien	*	Polyneuro Nephropa	opathie (2017) athie (2014)		Probleme	0	Medikamente - Letzte Abgaben	0	Letzte Diagnostik	,		0
	Medikamente	~	04 Adipositas	04 Adipositas		Pflegebedürftiger Ehemann	2021	AUGMENTIN Filmtabl 625 mg Erw, 1 x 20 Stk 13.06.2024					•
G	To see to a	~	05 Pflegebedürftiger Ehemann (2021)			Priegebedurrüger Enemann	2021	CRESTOR Filmtabl 20 mg. 1 x 30 Stk	13.06.2024	05.09.2023 Befundung (Offen) 14.06.2023 RX Thorax ap und seitlich (Thorax pathologisch)			
	Termine							13.06.2024				PL IV	
	Persönliches	*	06 St. n. Cholezystektomie (1988)										
	Kontakt	07 St. n. Appendektomie (1965)							20.03.2023 RX Thorax ap und seitlich (Offen)				
	KUIKAK		08 St. n. Radius	fraktur links (1978)						16.03.2022 Vorderarm	n rechts (Vord	erarmfraktur loco cla	ass
			Persönliche	Anamnese	0	Risikofaktoren	0	Allergien	0	Letzte Vitalwerte			•
			2015 St. nach	Myocardinfarkt		Bewegung: Keine regelmässige körperli	ch Anstrengung	Aminopenicillin-/Aminocephalosporin-Allergie		06.09.2023 13:17 Blub	druck	180/60 mm Hg	
			2009 Neue Kr	rankheit		Gewicht: Adipositas Grad 2				24.01.2024 09:46 Puls	frequenz	80 bpm	
			1998 Phlebektomie links		Arterielle Hypertonie: Sekundäre Hyper	tonie			19.06.2024 09:53 Gew	richt	80 kg		
				1988 St. n. Cholezystektomie		Diabetes mellitus: Diabetes mellitus Typ	2			19.06.2024 09:53 Grös	sse	172 cm	
			1982 St. n. Ch	olezystitis									
			1978 St. n. Ra	idiusfraktur links									
			Impfungen		0	Arbeitsunfähigkeit	٥	Cave		Letzte Dokument	e		0
						2				Bildschirmfoto			

Figure 11 - Medical dashboard with different lists (MIS: curaMED)

In the editing view of the diagnosis and problem list, all problems, diagnoses, and past history entries are listed in the right area below the selection list and can be dragged and dropped to the desired position in the tree structure of the diagnosis and problem list.

In the diagnosis and problem list itself, a branch or a group can be moved within the tree structure. If necessary, a node can be entered as free text. Clicking on a node opens the editing window for the health problem or medical record entry.

⁸ https://www.swisscom.ch/de/business/enterprise/angebot/health/solutions/curamed.html



CUra	SMED 🏫 home 🛅 agenda	🐣 РА		ABRECHNUNG	🔂 ARBEITSMITTEI	. 🖵 prax	ISADMINISTRATION
ø	i Dossier: Zbinden Anita 🔹	KST	1				
۹	25.12.1944 (80 Jahre) 8001 Zürich Patienten-Wr: 8	Au	iswahlliste	Problemliste importieren			×
. @	Allgemein 🕙 Problemliste	٥	۹				Erweitert 💌
o	S ⊕ Freitext <	Aktiv	×			Zurücksetzen	Voreinstellungen
ø	01 Radiusfraktur loco classico rechts (30.10 ×		Titel			Quelle	Datum
	02 Koronare Herzkrankheit ×		Harnwegsi	nfekt		Diagnosen	27.02.2023
18	Arterielle Hypertonie (Oktober 2009) × Herzinsiffizenz ×		Herzrhythr	nusstörung		Diagnosen	14.06.2023
Ŷ	St. nach Myocardinfarkt (2015) ×		Herzschritt	macher		Diagnosen	14.06.2023
	03 Diabetes mellitus Typ 2 (2007) ×		KVG			Behandlungsfälle	02.01.2023
~	Polyneuropathie (2017) × Nephropathie (2014) ×		Unfall			Behandlungsfälle	16.03.2022
ß	04 Adipositas ×		Unfall Knie	rechts		Behandlungsfälle	28.11.2023
	05 Pflegebedürftiger Ehemann (2021) ×		Neue Kranl	cheit		Ereignisse	2009
	06 St. n. Cholezystektomie (1988) ×		Phlebektor	nie links		Ereignisse	1998
	07 St. n. Appendektomie (1965) ×		St. n. Chole	zystitis		Ereignisse	1982
			St. n. Hume	rusfraktur		Ereignisse	1954
	08 St. n. Radiusfraktur links (1978) ×		Aminopeni	cillin-/Aminocephalosporin-	Allergie	Allergien	27.02.2023

Figure 12- Editing the diagnosis and problem list as links to the EMR

4.2 Medical Information System triaMED^{© 9 10}

The episode list is displayed as a linear list of health problems and can be sorted and filtered by various criteria, such as *active, inactive, closed,* or by *problem and diagnosis*.

Zbinden Anita. 25.12.1934 (90 0m KV: KPT/CPT Hauptsitz (HAM) / UV Fallführende Person: Messeri And	SUVA Aarau	migen, 079 450 56 79 (Handy)		Gru	nd / Stoppuhr		0:00:00	1	26.08.2024 16 Allgemeiner KG	:44 - Konsultation 3-Eintrag		Ŷ
Grundversorger • 😯 🐑 🦉 2 2650.45 (Rechnung) / 33.10 (1. Mahn Krankenakte ^ Konsultationen Text	Krankenakte Konsul	und Problemliste P	iagnosen robleme KG-Eir			te Vitalzeichen	J Laborblatt	AUF Neuer B	ericht Dokume	Impfunger	n Auftraj	gsblatt
Problemliste Probleme, Diagnosen Verlauf problemorientiert Allergien Allgemein			erlaufseintrag I t Probleme	Nagnosen	inträge E	xtras *						
Allergien Medikamente	Eintrag		Code	Art	Status	Substatus	Chronisch	Ereignisdatum	Erster Kontakt	Letzter Kontakt	Dok AA	VA
Medikamente	Hier klicken, um eine	en Eintrag zu erstellen und mit Taste	ENTER speichern									
Risikofaktoren	Suppintationstrauma	a am Oberen Sprunggelenk am recht	ten Fus	Diagnose	Aktiv	Hauptproblem	Nein	20.09.2019			MA	MA
Anamnese	Harnwegsinfekt			Diagnose	Aktiv	Nebenproblem	Nein	31.03.2016	09.09.2014	06.05.2019	MA	MA
- Frühere Krankheiten	Pflegebedurftiger Eh			Problem	Aktiv	Hauptproblem	Nein	02.01.2013	07.04.2017	07.04.2017	MA	
- Frühere Operationen		ernenin				A CONTRACTOR OF CONTRACTOR					1.001	1000
- Frühere Unfälle	Herzinsuffizenz			Diagnose	Aktiv	Hauptproblem	Nein	15.08.2016	12.04.2019	12.04.2019	MA	
Familienanamnese	Arterielle Hyptertoni	e	A16	Diagnose	Aktiv	Hauptproblem	Ja	08.03.2009	23.01.2009	24.10.2018	MA d	MA
- Sozialanamnese Hospitalisation	Diabetes mellitus Ty	rp 2	T90	Diagnose	Aktiv	Hauptproblem	Ja	27.07.2007	24.07.2007	18.07.2018	MA	MA
Status	Allgemeiner KG-Eint	trag		Problem	Aktiv	Defaultproblem	Ja	27.07.2007	24.07.2007	26.08.2024	MA	MA
- Freitext	Hepatitis B			Problem	Aktiv	Hauptproblem	Nein	01.05.2023	1		MA	MA
Vitalzeichen											1.44	1 Said
Allgemein ausführlich												
Diagnostik 🛸												
- Laborblatt Bildgebende Verfahren												
- Bildgebende Verfahren.												
Konsilien												
Therapie												
Medikamente												
Reichweite												
Behandlungen												
Operationen												
Eingriffe												
Arbeitsunfähigkeit Impfungen												
Imptungen Dokumente												

Figure 13- Episode list with filter (status = active, inactive, completed / problem, diagnosis)

⁹ https://www.mytriamed.ch/triamed/DE/Produkt/Hauptmerkmale.aspx

¹⁰ https://www.swisscom.ch/de/business/enterprise/angebot/health/solutions/triamed.html



According to the episode-oriented methodology, the health problem is linked to a contact and an episode and has various attributes. The attending physician and the responsible physician are stored together with the validation date. Various documents can be directly linked to the health problem. Coding is possible using different classifications.

KG Detail - Bearbeiten			×	KG Detail - Bearbeiten		×	
KG-Eintrag Spezialinfon	mationen Dokumente Basisinforma	tionen Codierung		KG-Eintrag Spezialinformatio	nen Dokumente Basisinformationen Codierung		
Wörterbucheintrag	Freitext	~		Art	Diagnose V		
Eintrag	Diabetes mellitus Typ 2	~	Q	Status	Aktiv ~		
Ereignisdatum	27.07.2007	Datum ~		Substatus	Hauptproblem ~		
Alter bei Ereignis	42	Jahre 🗸		Chronisch	☑ Ja		
Code]	Gesichert]] Ja		
Bemerkungen		^	Intern Sicherheitsgrad		klinisch 🗸		
				Zusatzinfo	akut		
		\vee					
				Lokalisation	irrelevant ~		
				Abrechnungsmodus	Tarmed (KVG) V		
Kontakt	27.07.2007 08:00 - Konsultation	i v					
Diagnose	Allgemeiner KG-Eintrag	~					
Ausführender Arzt	Messerli Andreas	~					
Verantwortlicher Arzt	Messerli Andreas	~					
	Übernehm	nen Speiche	m Abbrechen		Übernehmen Speichem A	Abbrechen	

Figure 14- Health problem with varioust attributes

KG D	KG Detail - Bearbeiten X			KG Detail - Bearbeiten		×
KG	Eintrag Spez	tialinformationen Dokumente Basisinformationen Codierung		KG-Eintrag Spezialinform	ationen Dokumente Basisinformationen Codierung	
	Datum 23.01.2017	Titel Guidelines Diabetes 🛛 🗟 🗟 🎭 🖓 🕞 🎽		Kontakt	27.07.2007 08:00 - Konsultation	
-	14.08.2014	Diabetes 2014		Diagnose	Diabetes mellitus Typ 2 \sim	
	17.11.2016	Bild vom 17.11.2016		Ausführender Arzt	Messerii Andreas \checkmark	
				Verantwortlicher Arzt	Messerli Andreas \checkmark	
				Datenherkunft	Manuelle Eingabe 🗸 🗸	-
				Visum a. Arzt	Visieren	
				Visum v. Arzt		
				Erstellt am	27.07.2007 09:28:08	
				Erstellt durch	Messerii Andreas \sim	
				Letzte Änderung am	20.01.2025 08:41:17	
				Letzte Änderung durch	Messerli Andreas \sim	
			~			
	Zwischenabla	age Scanner (PDF) Scanner (TIFF) Berichte Da	atei			
		Obernehmen Speichem Ab	brechen		Übernehmen Speichem Abbrecher	n

Figure 15- Health problem - links to documents and basic information

KG	-Eintrag	Spezialinformationen	Dokumente	Basisinform	ationen	Codierung		
Þ	Code T90	Beschreibung Diabetes mellit	us, primär nich	t insulinabh		ungs-System	Hauptcode	^
	W85	Schwangerscha	aftsdiabetes		ICPC-2	2		
	E10.9	Primär insulina	bhängiger Dial	betes mellit	ICD-10)		
								~

Figure 16- Health problem - Coding with different coding systems

In the edit view of the diagnosis and problem list, all health problems, a selection of the userselected medical record items, and a context-sensitive diagnosis and problem list are listed on the right. These items can be dragged and dropped into the tree structure on the left and sorted. In the diagnosis and problem list, a branch or group can be moved within the tree structure. If necessary, a node can be entered as free text.

Zbinden Anita, 25.12.1934 (90) Om 2 KV: KPT/CPT Hauptsitz (HAM) / UV: 5 Fallführende Person: Messerii Andre		Grund / Stoppuhr 0.0000 T Kontekt 26.08.2024 16.44 - Konsultation Diagnose Algemeiner KG-Eintrag					~
Grundversorger * G O 2650.45 (Rechnung) / 33.10 (1. Mahn Krankenakle ^ Konsultationen Text Eroblemitete	Krankenakte Konsultationen und Problemiliste Probleme KG-E	ntrag Verlauf Medikamente Vitalzeici	hen Laborblatt AUF Ne	uer Bericht Dokume	Impfungen	Auftragsblatt	
Problem: Degrosen Verlauf großbenorieniert Allergien Mickamerie Mickamerie Praihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraihorikkrein - Fraiher Vatale - Fraiher Vatale - Sozialaramese - Hospitaliasion - Status - Freiket - Vataleichen - Bidgeband Verfahren - Abdisungen - Medikamerie - Rechweite -	Checkensiste Control	Problems, Diagnosen Hepatis B Supprintationstrauma am Oberen Sprung Pneumonie Nieleescherden Starkes Feber Fieler Pneumonie Gastoententis Magen-Ulcus Einträge Bludzfuck kitzend Oberarm links: 180/110 1995: Gallenkolik Kopreoberfläche: 2.21 Gewicht BMI: 27.33 Ernährung: Augewogen Die die Matter Pieter Of Diabeter mellius: Pro 2, 150, 1 Pedroproshie Matter I Peter Of Diabeter mellius: Pro 2, 150, 1 Peterbreather (Mat)		Ereignisdatum 01.62.2023 20.09.2019 21.11.2018 25.06.2018 07.06.2018 07.06.2018 19.04.2018 06.03.2018 31.01.2018 23.01.2018 15.01.2018	Erster Kontakt 28.66.2018 07.06.2018 04.05.2018 10.40.2018 11.04.2018 11.07.2018 11.07.2018 11.07.2018 11.07.2018 11.07.2018	Letzter Kontakt 26.06.2018 07.06.2018 07.06.2018 04.05.2018 04.03.2018 31.01.2018 15.01.2018 15.01.2018	

Figure 17- Editing the diagnosis and problem list

The health problems can be displayed on the medical dashboard as a linear diagnosis list, a linear problem list, a past history list, and a hierarchical diagnosis and problem list. Two linear lists have the filter set to Active.



Zbinden Anita, 25.12.1934 (90) 0m 2 KV: KPT/CPT Hauptstz (HAM) / UV: 9 Fallführende Person: Messeri Andre	8t), Am Hang 21b , 3073 Gümligen, 079 450 56 79 (Ha SUVA Aarau	dy) Grund / Stoppu		26.08.2024 16:44 - Konsultation V Alloemeiner KG-Eintrag V
Fairunrende Person: Messeni Andre	-85		Diagnose	Allgemeiner KG-Eintrag ~
 Grundversorger GO 2650.45 (Rechnung) / 33,10 (1. Mahn 		🎯 🍞 📝 👸	/ 🍐 🛷 🙀	📛 🍦 😜
Krankenakte ^	Krankenakte Konsultationen Diagnoser und Problem		ente Vitalzeichen Laborblatt AUF Neuer Beric	ht Dokumente Impfungen Auftragsblatt
Problemliste	Problemliste	Diagnosenliste - Aktiv	Dauemedikamente/Antikoagulation	Allergien - Unverträglichkeiten
Probleme, Diagnosen Verlauf problemorientiert Allergien Allgemein Allergien Medikamente Medikamente Risikofaktoren	01. Diabetes mellitus Typ II (T90, W85, E10.9) - Nephropathie (N94) - Polyneuropathie 02. Harnwegsinfekt 03. Koronare Herzkrankheit - St. n. Myocardinfarkt 2008 - Atterielle Hyptertonie (A16)	Diabetes mellitus Typ II (2007) Arteriëlle Hyptertonie (2009) Herzinsufizenz (2016) Suppintationstrauma am Oberen Sprunggelenk am Harnwegsinfekt (2018)	TORASEMID Mepha Tabl 10 mg (1-1-1) VALSARTAN Spirip HC Filmtabl 160 mg (2-0-0) CRESTASTAIN Filmtabl 20 mg (1-0-0) ASPIRIN CARDIO Filmtabl 100 mg (1-0-0)	Asthma: Allergisches Asthma Clamoxyl RC Tabl 750 mg (Durchfall)
Anamnese	 Arterielle Hyptertonie (A16) Herzinsuffizienz (K77, A70) 			
Freitext	04. Adipositas			
Frühere Krankheiten	05. Pflegebedürftiger Ehemann	Problemliste - Aktiv 😂		
Frühere Operationen Frühere Unfälle Familienanamnese Sozialanamnese Hospitalisation	06. St. n. Cholezystekomie 1994 07. St. n. Appendektomie 1965 08. Diagnose Korrektur	Allgemeiner KG-Eintrag Pflegebedürftiger Ehemann Diagnose Korrektur Hepatitis B	CO-AMOXI Mepha Lactab 625 mg (1-1-1) Sigvarisstrüpmpfe	Rea Nein Blutentnahme rechts schwierig Thyroxin Kontrolle im Oktober 2018 Fifi hat Halsband
itatus				
Freitext				
Vitalzeichen		Risikofaktoren 😂	Reserve Medikamente 😔 🕒	Labor 🔒
Allgemein ausführlich Diagnostik Laborblatt Bildgebende Verfahren -Abklärungen Konsilien Therapie		Gewicht BMI 30 59 Nikotin: Raucher Diabetes mellitus: Diabetes melltius Typ 2	ZOLPIDEM Zentiva Filmtabi 10 mg (0-0-0-1) ALGIFOR-L forte Filmtabi 400 mg (1-1-1)	20 66 2016: CPR -y-GT, GPT/ALAT, GOT/ASA 10.88 2015: Uthium, Billivinia gesamt, Monosial 18.12 2014: CPR -y-GT, GPT/ALAT, GOT/ASA 15.10 2014: TC, Eosinophile, Segmentkernige, 19.07 2012: HbA1c, CPR -y-GT, GPT/ALAT, G 25.05 2011: CPR -y-GT, GPT/ALAT, GOT/ASA 19.05 2011: HbA1c, Uthum, AP, Billivibin gesa
Medikamente				
Reichweite		Persönliche Anamnese 🔒 🖓) Übrige Therapie 🔒 🖓	Übrige Diagnostik 🔒
Behandlungen Operationen Eingriffe Arbeitsunfähigkeit mpfungen Jokumente		2018 Preumonie 2001 Mycozadinfarkt 1995 Gallenkolik 1981 Tonsiletomie 1974 Appendektomie 1939 Humefraktur	2022 Physiotherapie: Verordnung Physiotherapie 2021 Appekektomie 2019 Physiotherapie: Verordnung Physiotherapie 2018 Physiotherapie: Verordnung Physiotherapie 2017 Physiotherapie: Verordnung Physiotherapie 2016 Physiotherapie: Verordnung Physiotherapie 2015 Wundharth RG/W Korf	06.05.2019 Thorax palsetilick: Normal 06.05.2019 Röntgen Beckenübersicht: Normal 14.03.2019 Fussröntgen: 26.10.2018 Befund vom: 08.01.2017 Ruhe-EKG: SR. 65Min regelmässi 20.10.2015 Röntgen Handelenk: Radiusfraktur

Figure 18- The Dashboard with a set of linear lists and the diagnosis and problem list



5 Directories

5.1 List of illustrations

Figure 1 - Treatment units for patient care4
Figure 2 - Lifecycle of a health problem from the problem to the past history
Figure 3 - An example of a simple diagnosis and problem list7
Figure 4 – Definition of 'episode of care'8
Figure 5 - Naming of an episode of care9
Figure 6 - WONCA - Episode of care with example9
Figure 7 - Health problem - Lifecycle during the course of the treatment
Figure 8 - Health problems in list form
Figure 9 - Diagnosis and Problem List in a linked tree15
Figure 10 - Past history with links to health problems and surgical procedures
Figure 11 - Medical dashboard with different lists (MIS: curaMED)19
Figure 12 - Editing the diagnosis and problem list as links to the EMR
Figure 13 - Episode list with filter (status = active, inactive, completed / problem, diagnosis). 20
Figure 14 - Health problem with varioust attributes
Figure 15 - Health problem - links to documents and basic information
Figure 16 - Health problem - Coding with different coding systems
Figure 17 - Editing the diagnosis and problem list22
Figure 18 - The Dashboard with a set of linear lists and the diagnosis and problem list 23

5.2 List of tables

Table 1 – Additional Diagnosis information	.6
Table 2 - Attributes of health problem (episode) 1	12
Table 3 - Attributes Metadata on the health problem (episode) 1	13

6 Glossary and list of abbreviations

6.1 Glossary

Term	Abbr.	Explanations	Source, standard
Diagnosis		Medical diagnoses are the classification of pathological processes into scientific terms	
Electronic Health Record	EHR	A systematic collection of electronically stored patient and population health data in a digital format. This data can be shared across healthcare organizations, facilitating seamless communication and continuity of care.	https://en.wikipe dia.org/wiki/Electr onic health recor d
Electronic Medical Record	EMR	An outpatient or inpatient electronic medical record that captures, stores, and manages a patient's health information in the primary system.	
Episode of Care	EoC	One or more contacts with one or more healthcare providers for the treatment of a health problem	



Healthcare professional	НСР	Professional recognized in Switzerland under federal	https://www.e-
		or cantonal law who performs or prescribes	<u>health-</u>
		treatment in the healthcare sector or dispenses	suisse.ch/glossar
		therapeutic agents or other products in connection with treatment	
Medical record	MR	Complete medical documentation of a patient	
Service provider		Person in a company or organization who provides	
		medical services for the treatment of patients, e.g. physician	
Nomenclature		A nomenclature (Latin: nomenclatura) is a set of	
		guidelines for naming objects in a particular subject	
		area. The totality of names in a subject area forms a	
		terminology (e.g., SNOMED, LOINC)	
Ontology		An ontology is the most comprehensive structure	
		that not only contains terms and classifications, but	
		also defines the relationships between terms and	
		their properties based on the underlying	
		terminologies	
Organization		Healthcare institution that provides medical services	
Personal Health Record	PHR	Personal Health Records are electronic applications	https://www.healt
		that allow patients to manage their health	hit.gov/faq/what-
		information in a private, secure, and confidential	personal-health-
		environment	record
Problem		A problem is a patient health issue that requires	
		either diagnostic or therapeutic intervention	

6.2 Abbreviations

Abbreviation	Explanations
EoC	Episode of Care
EHR	Electronic Health Record
EMR	Electronic Medical Record
НСР	Healthcare Professional
MR	Medical record
PHR	Personal Health Record
POMR	Problem Orientated Medical Record
SOAP	Subjective - Objective - Assessment - Plan