

DELIVERABLE SUMMARY SHEET

Project Number: **IST-2001-33049**

Project Acronym: **PROTOCOLURE**

Title: ***Improving medical protocols by formal methods***

Deliverable N°: D1

Due date: 28/2/2002

Delivery Date: 28/2/2002

Short Description:

Objectives

Selection and modeling of two reference protocols in Asbru.

Procedure

We gained an overview over existing guidelines and created a list of interesting features thereof by browsing repositories on the internet.

We selected two guidelines which together cover a wide range of guideline types. The first is the American Academy of Pediatrics' practice guideline for the Management of Hyperbilirubinemia in the Healthy Term Newborn. It is designed for use in a hospital. The second is The Dutch College of General Practitioners' (NHG) Standard for Type 2 Diabetes Mellitus. It is designed for use by family doctors.

Both guidelines were successfully modelled in Asbru.

Results

This deliverable contains the description of the selection process that lead to the final decision which protocols to model, a summary of the findings gained in the modeling process, the original text of both guidelines, and the Asbru model of both guidelines.

Partners owning: all

Partners contributed: Vrije Universiteit Amsterdam, Technische Universität Wien, Dutch Institute for Healthcare Improvement CBO, University of Aberdeen

Made available to: Public

Contents

This deliverable consist of the following parts:

- A Description of the selection and modeling of the two protocols.
 - 1 The selection process
 - 2 The modeling process
- B The original text of the first guideline, which is the American Academy of Pediatrics' practice guideline for the Management of Hyperbilirubinemia in the Healthy Term Newborn.
- C The original text of the second guideline, which is The Dutch College of General Practitioners (NHG) Standard for Type 2 Diabetes Mellitus.
- D The Asbru model of the first guideline.
- E The Asbru model of the second guideline.

1 The Selection Process

1.1 Selection criteria for guidelines

Our selection process was based on two views. The first view is language-independent based on several sources describing features of guidelines. The second view is based on our modeling experience and on those features we consider important.

There are many criteria or features of a guideline. We made a selection from those given by National Guideline Clearinghouse - NGC (www.ngc.org), the Guideline Elements Model - GEM (Shiffman et al.), the proposed extensions to NGC by Bernstam et al. and added some of our own (Asbru-related features).

There are two uses of a feature: Either you demand that a guideline under consideration has a certain value for this feature, e.g., we only look at high quality guidelines (e.g. sponsored by well-known organizations) published after 1996, which marks the introduction of evidence-based guidelines – before the guidelines were only consensus-based. Or you demand that the guidelines under consideration cover the whole spectrum of possible values of a feature, e.g., we want to look at guidelines for critical care plus primary care because these fields are so complementary and we want to have a broad view.

Another aspect of the selection process is the fact, that some features are easily selected in NGC since you can search for guidelines specifying those features. Others can only be determined by looking at the guideline, either for short – if the information needed is in the header or summary, or for quite long – if you must read the guideline to determine this feature.

According to these considerations, we produced table 2, to get a broader overview of a selected set of guidelines. The table presents different protocol features grouped into main categories. Last three columns show an initial assessment on their potential use for protocol selection steps. Thus, in a 1st selection step we decided to stick to the features present in the NGC search engine. The 2nd and 3rd selection steps refer to other selection criteria to be considered later on.

1.2 Looking for guidelines

Next step was to browse available guidelines. We selected NGC since it also contains non-US guidelines e.g. from SIGN (Scottish Intercollegiate Guideline Network) and it appears to be the most representative repository, with the additional advantage of allowing search of guidelines according to different features.

The following fields are included in the Guideline Comparison view of NGC

- Guideline Developer(s): Identifies the organization(s) responsible for the developing the guideline. In the Guideline Comparison view, the Guideline Developer and Release Date serve as the column headings for each guideline.

- Release Date: Identifies the date the guideline was released to the public.
- Title: Identifies the complete title of the guideline. Also identifies if the guideline has been adapted from another guideline.
- Length: Identifies the total number of pages (collation) for published full-text guideline.
- Developer(s): Identifies the guideline developer(s) and classifies guideline developer(s) organizations by major designation or function.
- Funding Source: Identifies source(s) of financial support for guideline development, as identified in the guideline text or by the guideline developer.
- Committee: Identifies formal name, if any, of committee/subcommittee within the guideline developer organization(s) responsible for developing the guideline.
- Group Composition: Describes the composition of the group/committee that authored the guideline, including professional degrees and affiliations, and lists the names of individual committee members, where given.
- Disease/Condition: Identifies the major areas of clinical medicine or health care addressed in the guideline. Values are expressed using the natural language expressions found in the text of the guideline.
- Category: Classifies the major focus of the guideline. Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Clinical Specialty: Classifies the clinical specialties that might use the guideline professionally. Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Intended Users: Classifies the groups intended to use the guideline. Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Objectives: Describes the objectives of the guideline, as specified in the guideline text by the developers.
- Target Population: Describes the target population(s) addressed in the guideline. Identifies restrictions on guideline use such as within a managed care plan or geographic region.
- Review Methods: Summarizes the methods used to review or validate the recommendations of the guideline. Validation is defined as "the results of any external review, comparison with guidelines from other groups or clinical testing of guideline use" (Hayward RSA, et al. More informative abstracts of articles describing clinical practice guidelines, *Ann Intern Med* 1993;118:731-737). Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Description of Review Methods: Describes the method of review, presenting additional definition of the values stated for corresponding attribute "Method of Review of the Guideline Recommendations." Identifies pilot testing or trial periods of clinical implementation.
- Endorser(s): Identifies organization(s) that have endorsed the guideline, if they are identified in the text of the guideline document or explicitly by the guideline developer.
- Outcomes Considered: Describes the most important specific outcomes or performance measures considered in the guideline. Includes patient outcomes described in treatment guidelines and diagnostic test performance characteristics described in diagnosis or screening guidelines.
- Cost analysis: Identifies if a cost analysis was performed, enabling users to search for guidelines with such analyses.
- Methods to Collect Evidence: Classifies the methods used to collect the evidence that was evaluated. Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Description of Methods to Collect Evidence: Describes/summarizes the specific methods used to collect the evidence, as identified in the text of the guideline or by the guideline developer. Can include detailed search strategies, lists of journals scanned, keywords, database sources, etc.
- Methods to Assess the Quality and Strength of Evidence: Classifies the methods used by the guideline developer to determine what relative importance to give the evidence they obtained. Values are selected from the appropriate concepts in the NGC Classification Scheme.
- Rating Scheme: Presents rating scheme for strength of evidence, when given.
- Methods to Analyze Evidence: Classifies the methods used by the guideline developer to evaluate the data in the evidence they obtained. Values are selected from the appropriate concepts in the NGC Classification Scheme.

- Description of Methods to Analyze Evidence: Describes the methods used to analyze the evidence. Presents additional definition for the values presented under "Methods used to Analyze the Evidence" (for example, defines "systematic" or summarizes the details of the meta-analyses).
- View Major Recommendations: Links to the "Major Recommendations," located in the Complete Summary.
- Availability of Full-Text: Links to the Full-Text guideline, where available OR links to the "Guideline Availability" information located in the Complete Summary.

The search form at NGC lets you enter the following search criteria:

- Free text: Disease/Condition, Treatment/Intervention, Organization.
- Selection from lists: Guideline Category, Organization Type, Intended Users, Clinical Specialty, Age of Target Population, Sex of Target Population: Publication Date (year).
- Checkboxes allow to only include guidelines that incorporate: A Formal Cost Analysis, an Implementation Plan, a Clinical Algorithm

The results can be sorted by relevance or publication date.

Unless stated otherwise, in the following queries the target audience were nurses, physicians, and students. Numbers are listed to give an idea of the amount of available guidelines.

Exploring the age

For category = treatment we found the following numbers of guidelines:

< 1 month	33
1-23 month	49
2-12 years	119
13-18 years	194
19-44 years	336
45-64 years	328
65-79 years	289
>80 years	131

This is not too surprising given the fact that elderly people are a big part of the population and they have many different sufferings.

Exploring the activities and presence of algorithms

You can select "contains clinical algorithm". Doing so we found (for all ages of patient):

Treatment	111	
Diagnosis	97	
Management	120	
any of these three	181	(which means that many guidelines are for several of these fields)
Prevention	30	

Prevention with or without clinical algorithm and for any target audience (including patients): 272 which means that most prevention guidelines do not have a clinical algorithm.

This picture shows that there are few guidelines containing clinical algorithms. However we found out that our view of an algorithm does not really match their appreciation – sometimes there are clear, procedural recommendations and the guideline is not marked to contain clinical algorithms, sometimes it is the other way round.

Exploring activities in neonates

Since the Vienna group focuses (in part) on neonates, we tried above query again for only patients of age<1 month.

Diagnosis	24
Evaluation	4
Management	43
Prevention	50
any of these four	96

any of these four groups for guidelines from 1996 or later: 80 (which means that they are all quite new). Remark: 1996 can be considered the year of birth of evidence based guidelines.

Narrowing the big horizon

Restricting the search only by demanding that category be any of diagnosis, evaluation, management, or treatment, you get	856
adding year ≥ 1996 , you get	737
adding the target audience nurses, physicians, and students, you get	684
removing students, you get	the same!
removing nurses too, i.e., keeping only physicians, you get	664

This means that 664 of 856 guidelines are not older than 1996 and for physicians.

Comparing specialties

Critical care	18	
Emergency medicine	113	
Family practice	280	
Primary care	271	seems nearly the same as family practice
Oncology	79	
Medical oncology	40	seems to be a subfield of oncology
Pediatrics	97	
Sports medicine	7	

These are not all specialties, but all which seemed interesting to us for some reason (historical etc.). Others include Cardiology, Behavioral Health, Adolescent Health, etc..

Restricting endorsing organization

Family practice without hospitals, private organizations, and profit organizations reduced the number from 280 to 216.

Some browsing

Next thing we did was some browsing through selected subsets. We looked at critical care since at least the Vienna group assumes to find more “process oriented”¹ and more “exact” guidelines there which would more likely include temporal information than family doctor & primary care. And we looked at oncology because this field has the reputation of defining exact protocols with temporal information for the treatment.

1.3 The final decision

Based on the criteria in tables 1 and 2, we finally decided to select the protocols for Jaundice and for Diabetes for this project. Among other reasons, the availability of domain experts that are available for these domains and our familiarity with these protocols were important in this decision.

¹ Discourse model vs. process model. These are two ways to look at the patient and her course of disease: The first way is to consider the situation of the patient consulting the doctor, starting with some information acquisition, followed by diagnosis, and finished by prescribing some drugs or treatment and maybe ordering the patient to come again. The second way is to consider the treatment of a patient as a single process, consisting of different treatments interleaving with repeated consultations with the physician. While the reasoning strategies of many physicians are situation-based, Asgaard/Asbru adopts the process-model perspective, because it makes dependencies explicit.

These two protocols represent two quite different domains which gives a maximum amount of overview with the given resources. They score fair on table 1 – while they contain more temporal abstractions, they are not evidence based. They are rated as standards which is a more precise document then a guideline, but less formal then a protocol, while the other alternatives are rated as guidelines.

The protocol for Jaundice selected is the American Academy of Pediatrics' practice guideline for the Management of Hyperbilirubinemia in the Healthy Term Newborn (Pediatrics 1994, 94(4):558-565). Its objective is the maintenance of a sufficiently low level of bilirubin in the blood of healthy term neonates by applying phototherapy and to safely detect any pathologic reasons of increased levels of bilirubin which might necessitate further action.

The protocol for Diabetes selected is the English translation of the new version of The Dutch College of General Practitioners (NHG) Standard for Type 2 Diabetes Mellitus (Huisarts en Wetenschap 1999, 42(2):67-85). Its objective is to provide a uniform framework for the diagnosis and management of Diabetes Mellitus Type 2 by family doctors.

While the first guideline was designed for use in a hospital setting the second was designed for use by family doctors in their practice. The first guideline was issued by an American consensus panel while the second was issued by a Dutch panel.

Both guidelines take a rather process oriented view and cover multiple encounters of the patient. In the neonatal care unit, encounters are defined as examinations and blood tests while in primary care encounters are visits of the patient at the physicians practice.

Table 1 – Features of guidelines derived from the guideline representation language Asbru and practical experience

Categories	Jaundice	Diabetes	Asthma	Brain Trauma
Hierarchical Decomposition	yes	yes	yes	yes
Knowledge Rich Control Structure				
Compulsory and Optional Plans	yes	yes	yes	yes
Temporal Order: Plan Layout	yes	yes	yes	yes
Conditions	moderate	moderate	moderate	moderate
Intentions	no	no	no	no
Preferences and Resources	no	no	no	no
Effects	no	no	little	moderate
Temporal Dimensions	little	moderate	moderate	moderate
Temporal Abstraction, Context	yes	yes	moderate	moderate
Quality of Protocols	medium	high	high	high
Evidenced-Based (y/n)	no	no	yes	yes
Indicators	no	no	?	?
Type of Protocols	non-spec.	GP	spec, GP	?
Guideline(G)-Standard(S)-Protocol(P)	S	S	G	G

Value spaces:

Hierarchical decomposition, Knowledge rich control structure, temporal dimensions, temporal abstraction, context, evidence-based, indicators: yes, moderate, no, ? = unknown.

Quality of protocols: low, medium, high.

Type of protocols: non-spec. = non-specific, GP = general practitioner, spec. = specialist, ? = unknown.

Guideline = G, Standard = S, Protocol = P.

Table 2 – Common features in guidelines according to National Guideline Clearinghouse - NGC, the Guideline Elements Model - GEM (Shiffman et al.), the proposed extensions to NGC by Bernstam et al. and some of our own (Asbru-related) features.

	Features	by	1 st selection (NGC driven)	2 nd	3 rd
GENERAL INFO.	developers, endorsers, ...	NGC, GEM, Bernstam & al	X		
	expiration date	GEM		X	
	release date	NGC, GEM, Bernstam & al	> 1995	X	
	review methods, methods to collect evidence, methods to analyze evidence, methods to assess evidence, rating scheme	NGC, GEM			
PURPOSE AND AUDIENCE	category	NGC, GEM, Bernstam & al	X		
	disease/condition (according to NLM's UMLS)	NGC, Bernstam & al		X	
	exceptions (factors that permit an exception to be made)	GEM			X
	intended users	NGC, GEM, Bernstam & al	physicians, nurses, students		
	objectives (e.g. recom. for screening canadian newborns for cystic fibrosis)	NGC, GEM			
	outcomes (e.g. increased life expectancies, length of hospital stay)	NGC, GEM			X
	specialty	NGC, Bernstam & al	X		
	target population	NGC, GEM, Bernstam & al	X		
APPLICATION	care setting (e.g. office, ICU)	GEM		X	
	number of encounters (one or many)	Bernstam & al		X	
	time frame (emergency, acute, chronic)	Bernstam & al		?	?
	usage mode (within or without encounter)	Bernstam & al		X	

(continued on the next page)

GENERAL INFO. (FOR MODELLERS)	availability of full text	NGC, GEM		CHECK!	
	computability (guiding, intermediate, algorithmic)	Bernstam&al		X?	
	format (e.g. text, with graphics, with diagrams, ...)	Bernstam&al		X	
	length				
	understandability by non-medical readers	Andi&Mar		X	
DETAILED INFO. (FOR MODELLERS)	actions (specified in the protocol/GL)	GEM			X
	algorithm (procedural)	GEM		X?	
	conditional recommendations & logic (declarative)	GEM			X
	cost	GEM			X
	intentions (sometimes different from outcomes/indicators)	Andi&Mar			X
	preferences	Andi&Mar			X
	reasons (explaining why the action has been triggered)	GEM			X
	resources	Andi&Mar			X
	strength of recommendation/evidence quality	GEM			X
	temporal dimensions	Andi&Mar			X

NOTES:

- ⊗ This table does not contain all the features included in the cited sources but rather lists those features that have been considered interesting to be used as criteria for protocol selection.
- ⊗ The information listed is based on:
Set of guideline attributes used for comparison in the National Guideline Clearinghouse site (see <http://www.guideline.gov/>, Site Map > Help > Guideline Comparison).
[Shiffman et al., 2000] Shiffman, R.N., Karras, B.T., Agrawal, A., Chen, R., Marengo, L. and Nath, S.: *GEM: A Proposal for a More Comprehensive Guideline Document Model Using XML*. J Am Med Inform Assoc. 2000, 7: 488-498.
[Bernstam et al., 2000] Bernstam, E.V., Ash, N., Peleg, M., Tu, S., Boxwala, A.A., Mork, P., Shortliffe, E.H. and Greenes, R.A.: *Guideline Classification to Assist Modeling, Authoring, Implementation and Retrieval*. AMIA Annual Fall Symposium 2000, 66-70.

2 The modeling process

Both selected protocols were modeled in Asbru. This process involved a series of discussions with domain experts, both face to face and via email. The resulting XML-code is enclosed in this document (part D and E). It was produced using XML-Spy and the Asbru DTD.

In the course of the modeling process we developed the following scheme for the modeling process. The most important issue is the invention of intermediate representations. It proved impossible to derive Asbru notation from the original guideline without some notation which summarizes the information in the guideline in concise and precise form.

There are many possible intermediate representations. In grouping them, we distinguish two dimensions:

1. language dependent versus language independent
2. high-level view versus detail or low-level view.

By language dependent we mean representations which are tailored to the target language – Asbru. Language independent representations are assumed to be useful for different formal representations, too.

By high-level view we mean the organization of the whole guideline – the relations between its principal parts. In contrast, the low-level view focuses on individual statements in the guideline. The high-level view corresponds with taking a top-down approach while the low-level view corresponds to taking a bottom-up approach. Top-down and bottom-up are the terms used in computer science.

Figure 1 on the next pages gives an overview of the representations we used and their categorization along the above dimensions.

The crucial point in any of these approaches is the merge between the results of bottom-up and top-down analysis. It often uncovers considerable gaps in the guideline which can only be filled in discussion with domain experts since common knowledge which is beyond dispute is rarely mentioned in guidelines.

Figure 1 – Elements of a multi-step modeling process

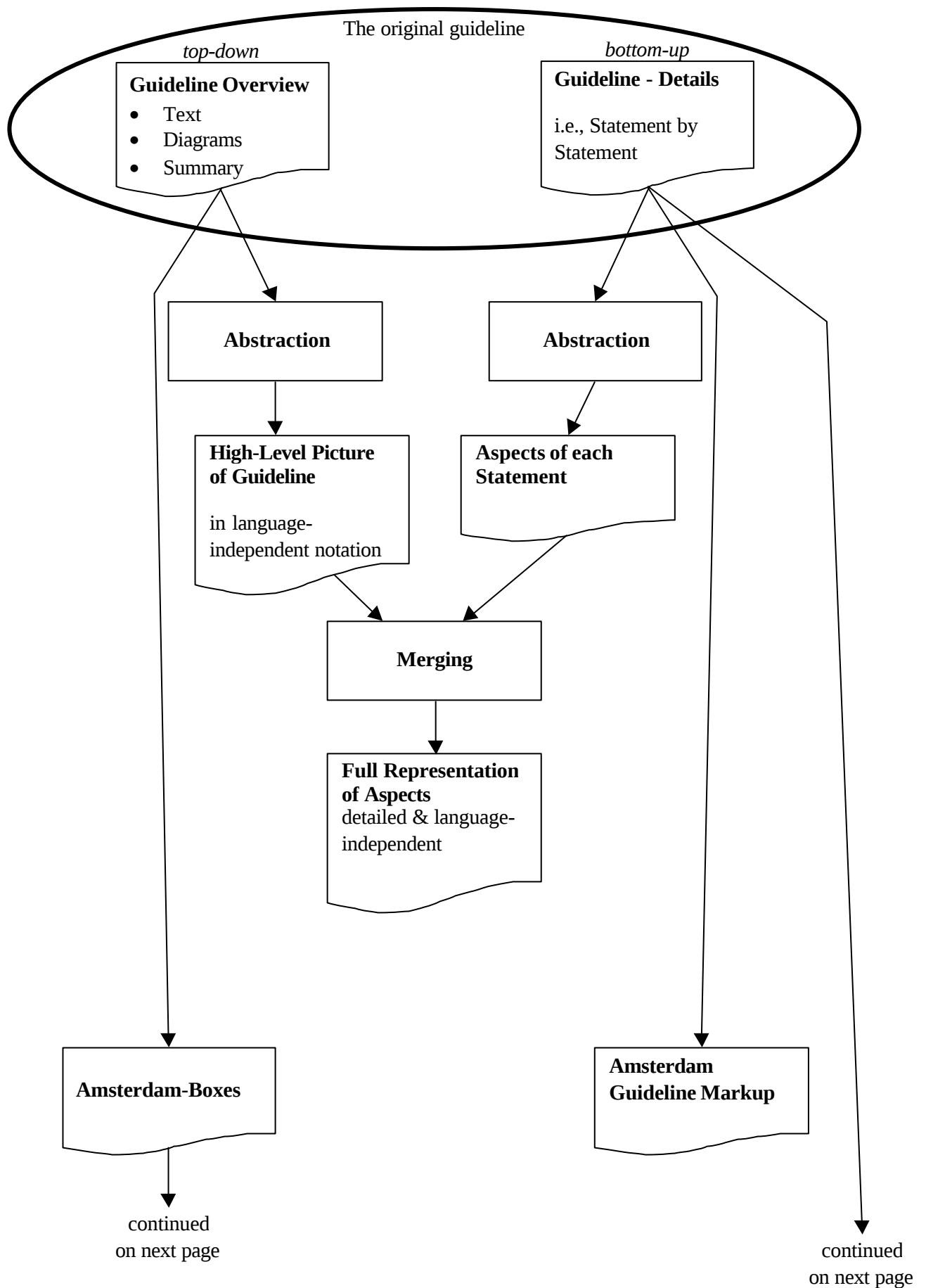
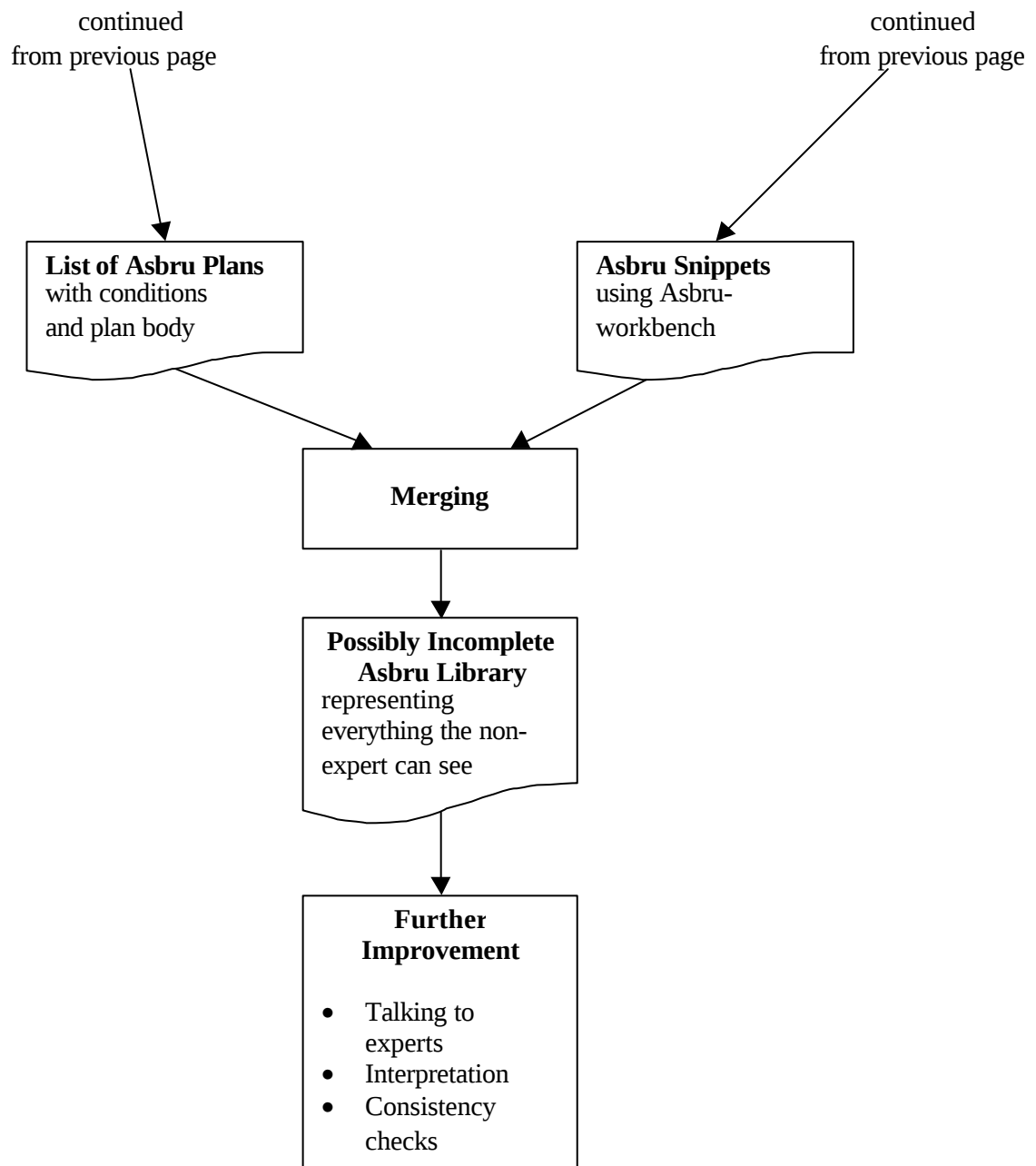


Figure 1 (continued)



Language-dependent high-level representations

As a first intuitive step we designed a box notation which represents the principal parts of an Asbru plan without sticking to the details of the XML-elements. The working title for it is "Amsterdam-Boxes". Table 3 shows an example taken from the Jaundice guideline. For each of the knowledge roles in Asbru there is a slot in the table. Not all of them need to be filled.

The advantages of this notation are:

- In any place in the table free text can be used, which is gradually replaced by more precise notation in the course of refinement iterations.
- It can be written using any word processor – no training is necessary.

The main limitation is the missing "intelligent" support, e.g., for consistency checks. Therefore, only human readers can judge the correctness of a plan library.

Table 3 – Amsterdam Boxes

PLAN 1.3	Check-for-jaundice>3-weeks	
INTENTIONS	ACHIEVE OVERALL STATE: Known(Possibility-of-cholestatic-disease)	
CONDITIONS	Filter:	(jaundice-clinically-significant yes * [__] [3 weeks, _] [__] Birth-Date)
EFFECTS		
PLAN-BODY	DO-ALL-SEQUENTIALLY DO-ALL-ANYORDER Ask TSB-value Ask direct-serum-bilirubin Ask total-urine-bilirubin Possibility-of-cholestatic-disease = yes Display "Perform appropriate laboratory assessment, including possibility of cholestatic jaundice"	
COMMENTS	This plan becomes active when jaundice is still present after 3 weeks.	

Language-dependent low-level representations

Since XML takes a lot of space when printed, we designed a box-representation which implements the tree structure of the elements as nested boxes. This notation (and the tool producing it in LaTeX) can be used on any XML-file, not only on Asbru code. Table 4 shows an example from the Jaundice guideline.

The main advantage of this approach is the improved readability compared to plain XML. The space consumed is less than XML but this gain depends on the number of attributes and the structure of the code, since some of the space gained by removing closing tags is used by the horizontal lines. The working title of this notation is "Vienna Boxes".

Table 4 – Vienna Boxes

plan	name = intensive-phototherapy	
conditions		
filter-condition		
logical-combination	type=or	
parameter-proposition	parameter-name = TSB-qualitative	
value-	type = equal	
description		
qualitative-constant	value = intensive-	
	phototherapy	
...		
...		
abort-condition		
logical-combination	type=or	
parameter-proposition	parameter-name = TSB-qualitative	
value-	type = not-equal	
description		
qualitative-constant		
	intensive-phototherapy	
...		
parameter-proposition	parameter-name = TSB-change	
value-	type = less-or-equal	
description		
numerical-constant	value = 0	
	unit = mg/dL/h	
...		
logical-combination	type=and	
parameter-proposition	parameter-name = TSB-change	
value-description	type = greater	
numerical-constant	value = 0	
	unit = mg/dL/h	
parameter-proposition	parameter-name = TSB-change	
value-description	type = less	
numerical-constant	value = 1	
	unit = mg/dL/h	
...		
plan-body		
plan-activation		
plan-schema	name = perform-intensive-	
	phototherapy	

To facilitate the modeling process, we created a special DTD called the Asbru workbench which allows the placement of any Asbru element at the top-level. The normal Asbru DTD would only allow a well-formed plan library which prohibits the notation of incomplete plan parts. In the course of the modeling process, the incomplete parts are completed and assembled to a valid plan-library which then can be parsed using the original Asbru DTD.

Language-independent representations

Taking a language independent approach, both for high-level and low-level view, a set of aspects can be distinguished which we grouped in four classes: Control, data, time, and reason. In the following we shortly describe them together with their well-known representations followed by a discussion of their potential of use.

Control

- Control flow: This is sometimes called the logic of the guideline. It can be represented as a flow chart or a decision table if it is simple.
- Invocation/decomposition structure: Which plan has which subplans, i.e., which plan is used/called by which other plan? Call graphs are used in many fields to model such dependencies.

Data

- Data definition: Which pieces of data/information are used in general? Where are they defined?
- Data abstraction: How are high-level concepts such as "high glucose-values" abstracted from the numeric measurements? What are the possible contexts for such abstractions?
- Data flow: The flow of information from the input sources to where it is used: which actions in the guideline obtain the information, which use it, and which transform it?

While the description of the data abstraction takes a declarative view, the description of the data flow takes a procedural point of view. There may be overlap in what both together describe, but one cannot completely be replaced by the other since in some cases the procedural aspects of a calculation or abstraction are important and sometimes they must be ignored completely to give the correct or clear picture.

Time

Some aspects of the ordering of protocol steps can be represented by flow charts but many other cannot, most notable constraints on the start, end, or duration of actions or states. We distinguish temporal relations and numeric information on temporal aspects.

- Temporal relation of protocol parts to each other, e.g., do x before y, can be described in a graph. Both Petri Nets and Flow Charts provide means to model most of these relations.
- Numeric information on start, end, or duration of steps or conditions are difficult to represent for a large set of plans. For a limited number of intervals, SOPOs (Sets Of Possible Occurrence) (J.-F. Rit.: Propagating temporal constraints for scheduling. In *Proceedings of the Fifth National Conference on Artificial Intelligence*, pages 383–388. Morgan Kaufman Publishers, 1986) can be used.

Reason

Since guidelines are designed to be read by humans working in the field of application of the guideline and not for computer interpretation, they contain a considerable amount of information which does not directly map to actions or decisions. Instead, these parts describe the intention lying behind certain actions, justifications for them, or general background information.

- Intentions (e.g., what to achieve or what to avoid) can be modeled in a precise way in Asbru but not in other guideline representations. Another, more simple but wider known form to express them are predicates.
- Justifications (e.g., recent reports on x indicate the need of y) are best represented as free text annotations to any parts of a guideline, be it abstractions, actions, or conditions.
- Background information not directly related to any action (e.g., 1/3 of all babies are jaundiced) serves education and motivation purposes. It needs only be considered in the modeling process if it should be displayed to the user at some point during protocol execution.

Since there are various representations for the different aspects, it would be a very worthwhile and very challenging task to find an integrated framework for their display and manipulation. The amount of work needed for this development justifies a separate project dedicated to it. In such a project, a team of peoples from various backgrounds – cognitive psychology, software engineering, and knowledge engineering – should merge their knowledge to devise a system for the interactive visualization of all aspects of a guideline at various levels of detail which would greatly enhance the modeling process of guidelines.

In addition to developing a diagrammatic language-independent representation of the guideline as describe above, marking up the roles or semantics of the different fragments of a guideline is an interesting preprocessing step. We experimented with an XML-based annotation with the working title "Amsterdam GL Markup".

It is based on XML and contains elements for

- recommendations (positive or negative, optionally mentioning alternatives),
- conditions,
- ordering of plan parts,
- temporal information,
- goals,
- preferences (with optional alternatives), and
- explanation.

Conclusion

When modeling the selected protocols, we gained insight in the need and potential for intermediate representation in the guideline modeling process. In particular we designed both language-dependent and language-independent notations for both high-level and low-level aspects of guidelines.

Although there is no time to further examine the findings described above in the course of this project, they provide a fertile ground for future projects.



Management of Hyperbilirubinemia in the Healthy Term Newborn

AMERICAN ACADEMY OF PEDIATRICS

Provisional Committee for Quality Improvement and Subcommittee on Hyperbilirubinemia

Each year approximately 60% of the 4 million newborns in the United States become clinically jaundiced. Many receive various forms of evaluation and treatment. Few issues in neonatal medicine have generated such long-standing controversy as the possible adverse consequences of neonatal jaundice and when to begin treatment. Questions regarding potentially detrimental neurologic effects from elevated serum bilirubin levels prompt continuing concern and debate, particularly with regard to the management of the otherwise healthy term newborn without risk factors for hemolysis.[1-16] Although most data are based on infants with birth weights ≥ 2500 g, "term" is hereafter defined as 37 completed weeks of gestation.

Under certain circumstances, bilirubin may be toxic to the central nervous system and may cause neurologic impairment even in healthy term newborns. Most studies, however, have failed to substantiate significant associations between a specific level of total serum bilirubin (TSB) during nonhemolytic hyperbilirubinemia in term newborns and subsequent IQ or serious neurologic abnormality (including hearing impairment).[3-5] Other studies have detected subtle differences in outcomes associated with TSB levels, particularly when used in conjunction with albumin binding tests and/or duration of exposure.[5,15,17,18] In almost all published studies, the TSB concentration has been used as a predictor variable for outcome determinations.

Factors influencing bilirubin toxicity to the brain cells of newborn infants are complex and incompletely understood; they include those that affect the serum albumin concentration and those that affect the binding of bilirubin to albumin, the penetration of bilirubin into the brain, and the vulnerability of brain cells to the toxic effects of bilirubin. It is not known at what bilirubin concentration or under what circumstances significant risk of brain damage occurs or when the risk of damage exceeds the risk of treatment. Concentrations considered harmful may vary in different ethnic groups or geographic locations and may be lower outside North America or northern Europe. Reasons for apparent geographic differences in risk for kernicterus are not clear; the following practice parameter may not apply worldwide.

There are no simple solutions to the management of jaundiced neonates. Continuing uncertainties about the relationship between serum bilirubin levels and brain damage as well as differences in patient populations and practice settings contribute to variations in the management of hyperbilirubinemia. Early postpartum discharge from the hospital further complicates the management of jaundiced newborns, because it places additional responsibilities on parents or guardians to recognize and respond to developing jaundice or clinical symptoms.

Some conditions significantly increase the risk of hyperbilirubinemia, including history of a previous sibling with hyperbilirubinemia, decreasing gestational age, breast-feeding, and large weight loss after birth. Although newborns of 37 weeks' gestation and above are considered "term," infants 37 to 38 weeks of gestation may not nurse as well as more mature infants, and there is a strong correlation between decreasing gestational age and risk for hyperbilirubinemia. Infants born at 37 weeks' gestation are much more likely to develop a serum bilirubin level of 13 mg/dL or higher than are those born at 40 weeks' gestation.[19-22]

METHODOLOGY

The Task Force on Quality Assurance (now designated the Provisional Committee on Quality Improvement) selected the management of hyperbilirubinemia as a topic for practice parameter development and appointed a subcommittee that performed a comprehensive literature review. Two independent MEDLINE searches identified primarily retrospective epidemiologic data derived almost exclusively from North American and European literature. The subcommittee also relied heavily on both the data and analyses contained in a 1990 report by Newman and Maisels. [3] Moreover, the total experience analyzed involved a relatively limited number of healthy term infants with bilirubin levels in excess of 25 mg/dL (428 μ mol/L) making it difficult to draw firm conclusions from the published data. The recommendations that follow stem from careful consideration of currently available information, as analyzed and interpreted by subcommittee members and consultants, and are based on evidence when appropriate data exist and derived from consensus when data are lacking. The subcommittee's recommendations are supported by a technical report containing a world literature search and analysis, and updated literature review. The technical report is available from the Publications Department of the American Academy of Pediatrics (AAP).

RECOMMENDATIONS

The following recommendations were developed by the AAP to aid in the evaluation and treatment of the healthy term infant with hyperbilirubinemia. Important in the development of these guidelines is the general belief that therapeutic interventions for hyperbilirubinemia in the healthy term infant may carry significant risk relative to the uncertain risk of hyperbilirubinemia in this population. In these guidelines, the AAP has attempted to describe a range of acceptable practices, recognizing that adequate data are not available from the scientific literature to provide more precise recommendations.

Evaluation

1. Maternal prenatal testing should include ABO and Rh(D) typing and a serum screen for unusual isoimmune antibodies.[23]
2. A direct Coombs' test, a blood type, and an Rh(D) type on the infant's (cord) blood are recommended when the mother has not had prenatal blood grouping or is Rh-negative.
3. Institutions are encouraged to save cord blood for future testing, particularly when the mother's blood type is group O. Appropriate testing may then be performed as needed.
4. When family history, ethnic or geographic origin, or the timing of the appearance of jaundice suggests the possibility of glucose-6-phosphate dehydrogenase deficiency or some other cause of hemolytic disease, appropriate laboratory assessment of the infant should be performed.
5. A TSB level needs to be determined in infants noted to be jaundiced in the first 24 hours of

life.

6. In newborn infants, jaundice can be detected by blanching the skin with digital pressure, revealing the underlying color of the skin and subcutaneous tissue. The clinical assessment of jaundice must be done in a well-lighted room. Dermal icterus is seen first in the face and progresses caudally to the trunk and extremities. As the TSB level rises, the extent of cephalocaudal progression may be helpful in quantifying the degree of jaundice; use of an icterometer or transcutaneous jaundice meter may also be helpful.[24-26]

7. Evaluation of newborn infants who develop abnormal signs such as feeding difficulty, behavior changes, apnea, or temperature instability is recommended--regardless of whether jaundice has been detected--to rule out underlying illness ([Table 1](#)).

8. Follow-up should be provided to all neonates discharged less than 48 hours after birth by a health care professional in an office, clinic, or at home within 2 to 3 days of discharge.[23]

9. Approximately one third of healthy breast-fed infants have persistent jaundice after 2 weeks of age.[27] A report of dark urine or light stools should prompt a measurement of direct serum bilirubin. If the history (particularly the appearance of the urine and stool) and physical examination results are normal, continued observation is appropriate. If jaundice persists beyond 3 weeks, a urine sample should be tested for bilirubin, and a measurement of total and direct serum bilirubin obtained.

Treatment

Decisions about therapeutic intervention are tempered by clinical judgment based on the infant's history, course, and physical findings and are balanced by comparing the potential benefits with the risks. As appropriate, physicians are encouraged to discuss management options and their recommendations with parents or other guardians. The guidelines in [Table 2](#) are recommended for infants initially seen with elevated TSB levels, as well as for infants who have been followed up for clinical jaundice. Similar guidelines have been used in Great Britain.[28,29] Direct bilirubin measurements vary substantially as a function of individual laboratories and their instrumentation. For the purposes of the otherwise healthy appearing jaundiced newborn, it is recommended that the direct bilirubin measurement not be subtracted from the TSB level and that the TSB level be relied on as the relevant criterion.

Determination of the rate of rise of TSB and the infant's age may help determine how often to monitor bilirubin levels and whether to begin photo-therapy. Continued observation may be an appropriate alternative to repeated TSB testing and phototherapy.

There is continuing uncertainty about what specific TSB levels warrant exchange transfusion. Intensive phototherapy (Appendix) is recommended in infants initially seen with a TSB concentration in the exchange transfusion range ([Table 2](#)) while preparations are being made for exchange transfusion. Intensive phototherapy should produce a decline in the TSB level of 1 to 2 mg/dL within 4 to 6 hours, and the decline should continue thereafter. If the TSB level does not decline but persists above the level recommended for exchange transfusion, most experts recommend exchange transfusion ([Table 2](#)). Exchange transfusion is also indicated in infants whose TSB levels rise to exchange transfusion levels in spite of intensive phototherapy. In any of the above situations, failure of intensive phototherapy to lower the TSB level strongly suggests the presence of hemolytic disease or some other pathologic process and warrants further investigation.

These guidelines apply to infants without signs of illness or apparent hemolytic disease. It may be

difficult to rule out ABO hemolytic disease as well as rarer causes of hemolysis.

The evaluation and treatment of hyperbilirubinemia in the healthy term infant is presented in the clinical [Algorithm](#).^[30]

Management of Hyperbilirubinemia in the Healthy Term Newborn by Age (in Hours)

1. Infants ≤ 24 hours old are excluded from [Table 2](#), because jaundice occurring before age 24 hours is generally considered "pathologic" and requires further evaluation. Although some healthy infants appear slightly jaundiced by 24 hours, the presence of jaundice before 24 hours requires (at least) a serum bilirubin measurement and, if indicated, further evaluation for possible hemolytic disease or other diagnoses. Phototherapy and/or exchange transfusion may be indicated for rapidly rising TSB levels in the first 24 hours of life.

2. For the treatment of the 25- to 48-hour-old infant, phototherapy may be considered (see [Table 2](#) for definition) when the TSB level is ≥ 12 mg/dL (210 $\mu\text{mol/L}$). Phototherapy should be implemented when the TSB level is ≥ 15 mg/dL (260 $\mu\text{mol/L}$). If intensive phototherapy fails to lower a TSB level of ≥ 20 mg/dL (340 $\mu\text{mol/L}$), exchange transfusion is recommended. If the TSB level is ≥ 25 mg/dL (430 $\mu\text{mol/L}$) when the infant is first seen, intensive phototherapy is recommended while preparations are made for an exchange transfusion. If intensive phototherapy fails to lower the TSB level, exchange transfusion is recommended. The higher TSB levels in a 25- to 48-hour-old infant suggest that the infant may not be healthy and indicate the need for investigation into the cause of hyperbilirubinemia, such as hemolytic disease.

3. Phototherapy may be considered for the 49- to 72-hour-old jaundiced infant when the TSB level is ≥ 15 mg/dL (260 $\mu\text{mol/L}$). Phototherapy is recommended when the TSB level reaches 18 mg/dL (310 $\mu\text{mol/L}$). If intensive phototherapy fails to lower the TSB level when it reaches or is predicted to reach 25 mg/dL (430 $\mu\text{mol/L}$), an exchange transfusion is recommended. If the TSB level is ≥ 30 mg/dL (510 $\mu\text{mol/L}$) when the infant is first seen, intensive phototherapy is recommended while preparations are made for exchange transfusion. If intensive phototherapy fails to lower the TSB level, an exchange transfusion is recommended.

4. For the infant > 72 hours old, phototherapy may be considered if the TSB level reaches 17 mg/dL (290 $\mu\text{mol/L}$). Phototherapy needs to be implemented at a TSB level of ≥ 20 mg/dL (340 $\mu\text{mol/L}$). If intensive phototherapy fails to lower a TSB level of ≥ 25 mg/dL (430 $\mu\text{mol/L}$), exchange transfusion is recommended. If the TSB level is ≥ 30 mg/dL (510 $\mu\text{mol/L}$) when the infant is first seen, intensive phototherapy is recommended while preparations are made for an exchange transfusion. If intensive phototherapy fails to lower the TSB level, an exchange transfusion is recommended.

In all of the above situations, intensive phototherapy ([Appendix](#)) should be used if the TSB level does not decline under conventional phototherapy. Intensive phototherapy should produce a steady decline in the concentration of TSB. If this does not occur, the presence of hemolytic disease or some other pathologic process is suggested and warrants further investigation.

Treatment of Jaundice Associated With Breast-feeding in the Healthy Term Newborn

The AAP discourages the interruption of breast-feeding in healthy term newborns and encourages continued and frequent breast-feeding (at least eight to ten times every 24 hours). Supplementing nursing with water or dextrose water does not lower the bilirubin level in jaundiced, healthy, breast-feeding infants.^[31] Depending on the mother's preference and the physician's judgment, however, a variety of options are presented in [Table 3](#) for possible implementation beyond observation, including supplementation of breast-feeding with formula or the temporary

interruption of breast-feeding and substitution with formula, either of which can be accompanied by phototherapy.

DOCUMENTATION

This practice parameter is designed to assist the pediatrician and other health care providers by providing a framework for the management of hyperbilirubinemia in the healthy term newborn. It is not intended to replace the physician's clinical judgment or to establish a single protocol applicable to all such newborns with hyperbilirubinemia. It is understood that some clinical problems may not be adequately addressed by the practice parameter, which cannot be considered to represent an exclusive standard of care. Physicians are urged to document their management strategies, including any significant deviation from these or other guidelines and the rationale for the course of action taken.

Finally, all physicians and other health care providers caring for jaundiced newborns are encouraged to continue appraising and incorporating into their practices new scientific and technical advances as clinical evidence of their effectiveness becomes established.

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APPENDIX

Phototherapy

There is no standardized method for delivering phototherapy. Phototherapy units vary widely, as do the types of lamps used in these units. The following factors strongly influence the efficacy of phototherapy:

The energy output (or irradiance) of the phototherapy light in the blue spectrum, measured in $\mu\text{W}/\text{cm}^2$;

The spectrum of light delivered by the phototherapy unit, determined by the type of light source.

The surface area of the infant exposed to phototherapy.

Commonly used phototherapy units contain a number of daylight, cool white, blue, or "special blue" fluorescent tubes. Other units use tungsten-halogen lamps in different configurations, either free-standing or as part of a radiant warming device. Most recently, fiberoptic systems have been developed that deliver light from a high-intensity lamp to a fiberoptic blanket. Most of these devices deliver enough output in the blue-green region of the visible spectrum to be effective for standard phototherapy use. When bilirubin levels approach the range at which exchange transfusion might be indicated, maximal efficacy should be sought. This can be achieved in the following manner.

The use of special blue tubes in standard fluorescent phototherapy units. Note that special blue (narrow spectrum) tubes carry the designation F20 T12/BB are not the same as blue tubes (F20 T12/B).[1] Special blue lights have the disadvantage of making the infant look blue, but in healthy newborns this is generally not a concern during the relatively brief period that phototherapy is necessary. To mitigate this effect, four special blue tubes may be used in the central portion of a standard phototherapy unit and two daylight fluorescent tubes may be used on either side.[2]

Regardless of the type of light used, its maximum irradiance should be employed. Standard fluorescent lamps accomplish this by bringing the light as close to the baby as possible. In the full-term nursery, this is most easily achieved by placing the infant in a bassinet (not an

incubator) and lowering the lamps to within 15 to 20 cm of the infant. If this treatment causes slight warming of the infant, the lamps need to be elevated slightly. With halogen phototherapy lamps, however, there are no data to indicate how close to the baby the lamp can be positioned without incurring the risk of a burn. When halogen lamps are used, manufacturers' recommendations should be followed. The reflectors, light source, and transparent light filters (if any) should be kept clean.

The third way to improve phototherapy efficiency is to increase the surface area of the infant exposed to the lights. This is done, most simply, by placing the infant on a fiberoptic blanket while using a standard phototherapy system described above.[3] If fiberoptic units are not available, several phototherapy lamps can be placed around the infant. When a single phototherapy unit is used, the area of exposure can be increased by placing a white reflecting surface (such as a sheet) around the bassinet so that light is reflected onto the baby's skin. Removing diapers will also increase the exposed surface area.

Intermittent Versus Continuous Phototherapy

Clinical studies comparing intermittent with continuous phototherapy have produced conflicting results.[4-6] Because all light exposure increases bilirubin excretion (compared with darkness), no plausible scientific rationale exists for using intermittent phototherapy. In the majority of circumstances, however, phototherapy does not need to be continuous. Phototherapy may be interrupted during feeding or brief parental visits. Individual judgment should be exercised. If the infant is admitted to the hospital with a bilirubin level ≥ 25 mg/dL (428 $\mu\text{mol/L}$), intensive phototherapy should be administered continuously until a satisfactory decline in the serum bilirubin level occurs or exchange transfusion is initiated.

Intensity of Phototherapy

The intensity of the phototherapy (number of lights, distance from infant, and use of double phototherapy, use of special lights) should also be tailored to the infant's needs. In many circumstances intensive phototherapy is not necessary. However, if the serum bilirubin level is rising in spite of conventional phototherapy or the infant is admitted with a serum bilirubin concentration within the exchange transfusion range, the necessary steps should be taken to increase the intensity of phototherapy during preparation for exchange transfusion. With the light sources commonly used, it is impossible to overdose the patient.

Hydration

To our knowledge, no evidence exists that excess fluid administration affects the serum bilirubin concentration. Some infants who are admitted with high bilirubin levels are also mildly dehydrated, however, may need supplemental fluid intake to correct their dehydration. As these infants are almost always breast-fed, the best fluid to use in these circumstances is a milk-based formula, because it inhibits the enterohepatic circulation of bilirubin and helps lower the serum bilirubin level. Because the photoproducts responsible for the decline in serum bilirubin are excreted in both urine and bile, maintaining adequate hydration and good urine output should help improve the efficacy of phototherapy.[7] Routine supplementation (with dextrose water) of infants receiving phototherapy is not indicated.

When Should Phototherapy Be Stopped?

A recent study found that, in infants who do not have hemolytic disease, the average bilirubin rebound after phototherapy is less than 1 mg/dL (17 $\mu\text{mol/L}$).[8] Phototherapy may be discontinued when the serum bilirubin level falls below 14 to 15 mg/dL. Discharge from the hospital need not be delayed in order to observe the infant for rebound and, in most cases, no further measurement of bilirubin is necessary. If phototherapy is initiated early and discontinued before the infant is 3 to 4 days old, additional outpatient follow-up may be necessary.

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The practice parameter, "Management of Hyperbilirubinemia in the Healthy Term Newborn," was reviewed by the appropriate committees and sections of the American Academy of Pediatrics (AAP), including the Chapter Review Group, a focus group of office-based pediatricians representing each AAP District: Gene R. Adams, MD; Robert M. Corwin, MD; Lawrence C. Pakula, MD; Barbara M. Harley, MD; Howard B. Weinblatt, MD; Thomas J. Herr, MD; Kenneth E. Matthews, MD; Diane Fuguay, MD; Robert D. Mines, MD; and Delosa A. Young, MD. The clinical algorithm was developed by Carmie Margolis, MD; Agnatha Golan, MD; Professor Michael Karplus, Ben Gurion University of Negev, Beer Sheva, Israel; and James R. Cooley, MD, Harvard Community Health Plan.

The American Medical Association (AMA) Specialty Society Practice Parameter Partnership reviewed the neonatal hyperbilirubinemia practice parameter and found it to be in conformance with AMA attributes for practice parameter development.

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

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Table 1. Factors To Be Considered When Assessing a Jaundiced Infant*

Factors that suggest the possibility of hemolytic disease
Family history of significant hemolytic disease
Onset of jaundice before age 24 h
A rise in serum bilirubin levels of more than 0.5 mg/dL/h
Pallor, hepatosplenomegaly
Rapid increase in the TSB level after 24-48 h (consider G6PD deficiency)
Ethnicity suggestive of inherited disease (G6PD deficiency, etc)
Failure of phototherapy to lower the TSB level
Clinical signs suggesting the possibility of other diseases such as sepsis or galactosemia in which jaundice may be one manifestation of the disease
Vomiting
Lethargy
Poor feeding
Hepatosplenomegaly
Excessive weight loss
Apnea
Temperature instability
Tachypnea
Signs of cholestatic jaundice suggesting the need to rule out biliary atresia or other causes of cholestasis
Dark urine or urine positive for bilirubin
Light-colored stools
Persistent jaundice for >3 wk

* TSB indicates total serum bilirubin; G6PD, glucose-6-phosphate dehydrogenase.

Table 2. Management of Hyperbilirubinemia in the Healthy Term Newborn*

Age, hours	TSB Level, mg/dL (pmol/L)			
	Consider Phototherapy†	Phototherapy	Exchange Transfusion if Intensive Photo therapy Fails‡	Exchange Transfusion and Intensive Phototherapy
≤24§	...	...	...	...
25-48	≥12 (210)	≥15 (260)	≥20 (340)	≥25 (430)
49-72	≥15 (260)	≥18 (310)	≥25 (430)	≥30 (510)
>72	≥17 (290)	≥20 (340)	≥25 (430)	≥30 (510)

* TSB indicates total serum bilirubin.

† Phototherapy at these TSB levels is a clinical option, meaning that the intervention is available and may be used on the basis of individual clinical judgment. For a more detailed description of phototherapy, see the Appendix.

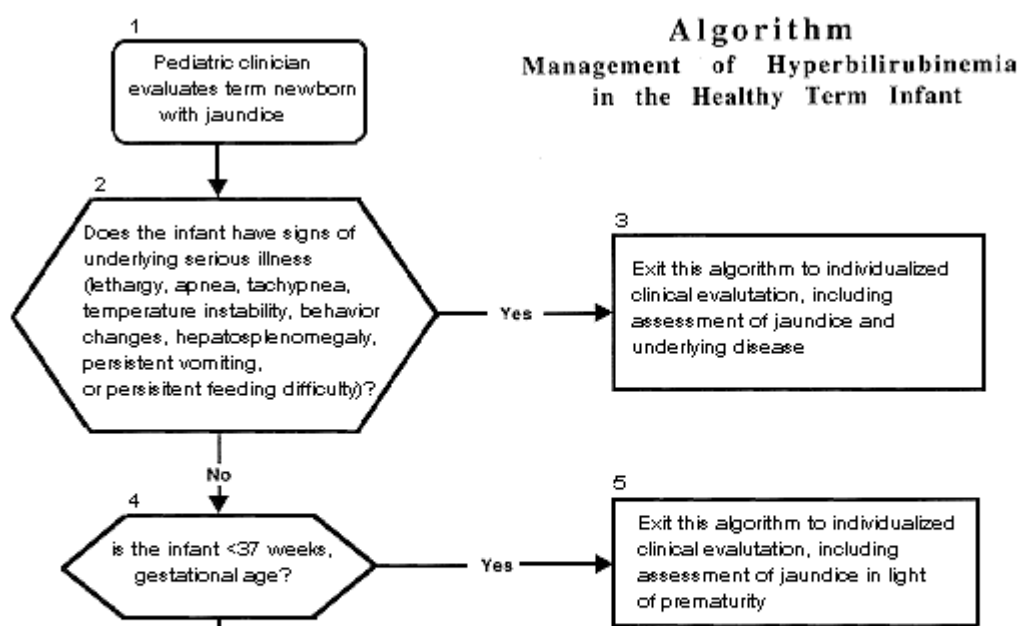
‡ Intensive phototherapy (Appendix) should produce a decline of TSB of 1 to 2 mg/dL within 4 to 6 hours and the TSB level should continue to fall and remain below the threshold level for exchange transfusion. If this does not occur, it is considered a failure of phototherapy.

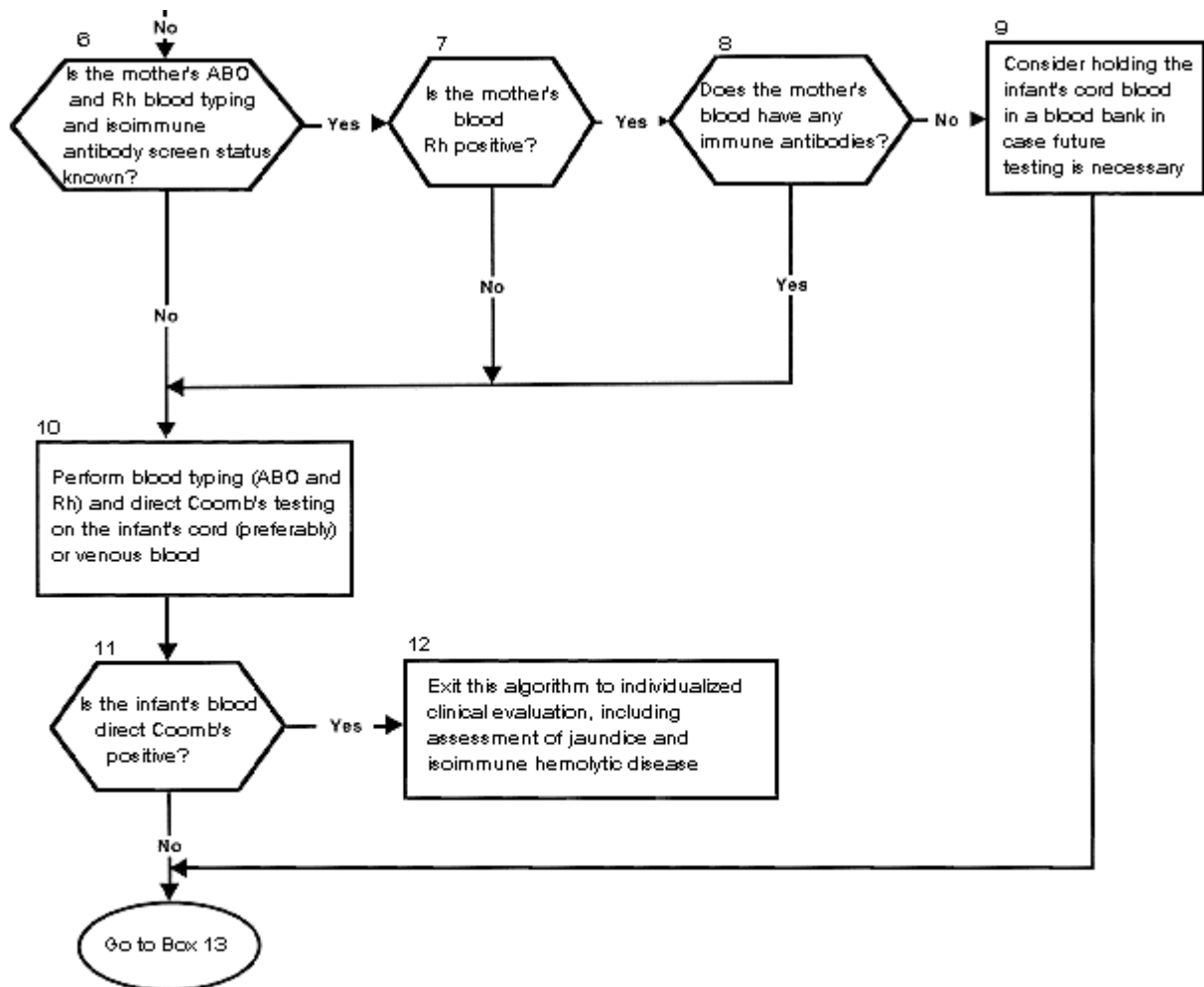
§ Term infants who are clinically jaundiced at ≤ 24 hours old are not considered healthy and require further evaluation (see text).

Table 3. Treatment Options for Jaundiced Breast-fed Infants

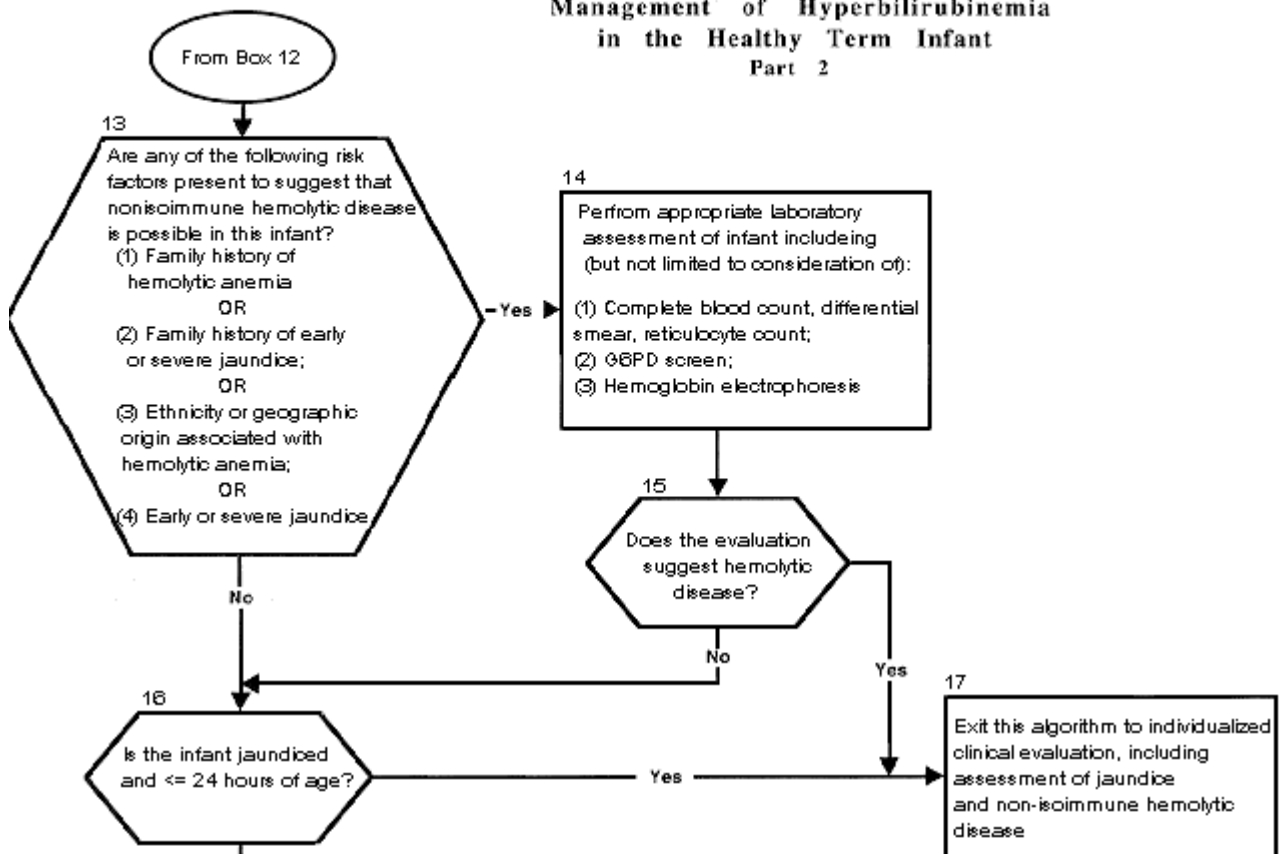
Observe
Continue breast-feeding; administer phototherapy
Supplement breast-feeding with formula with or without phototherapy
Interrupt breast-feeding; substitute formula
Interrupt breast-feeding; substitute formula; administer phototherapy

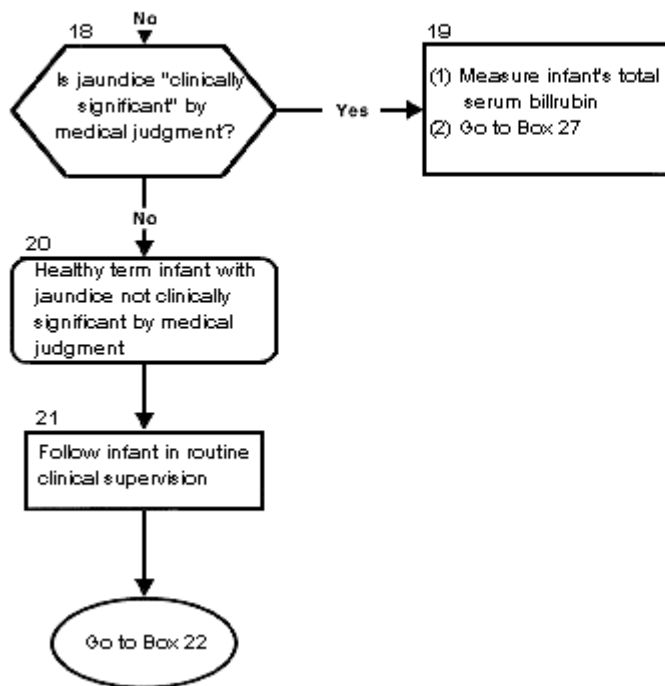
ALGORITHM



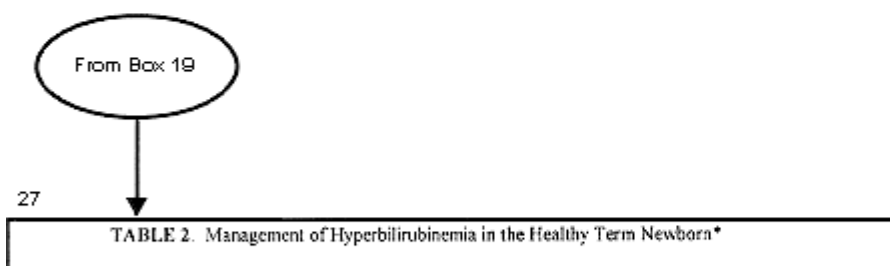
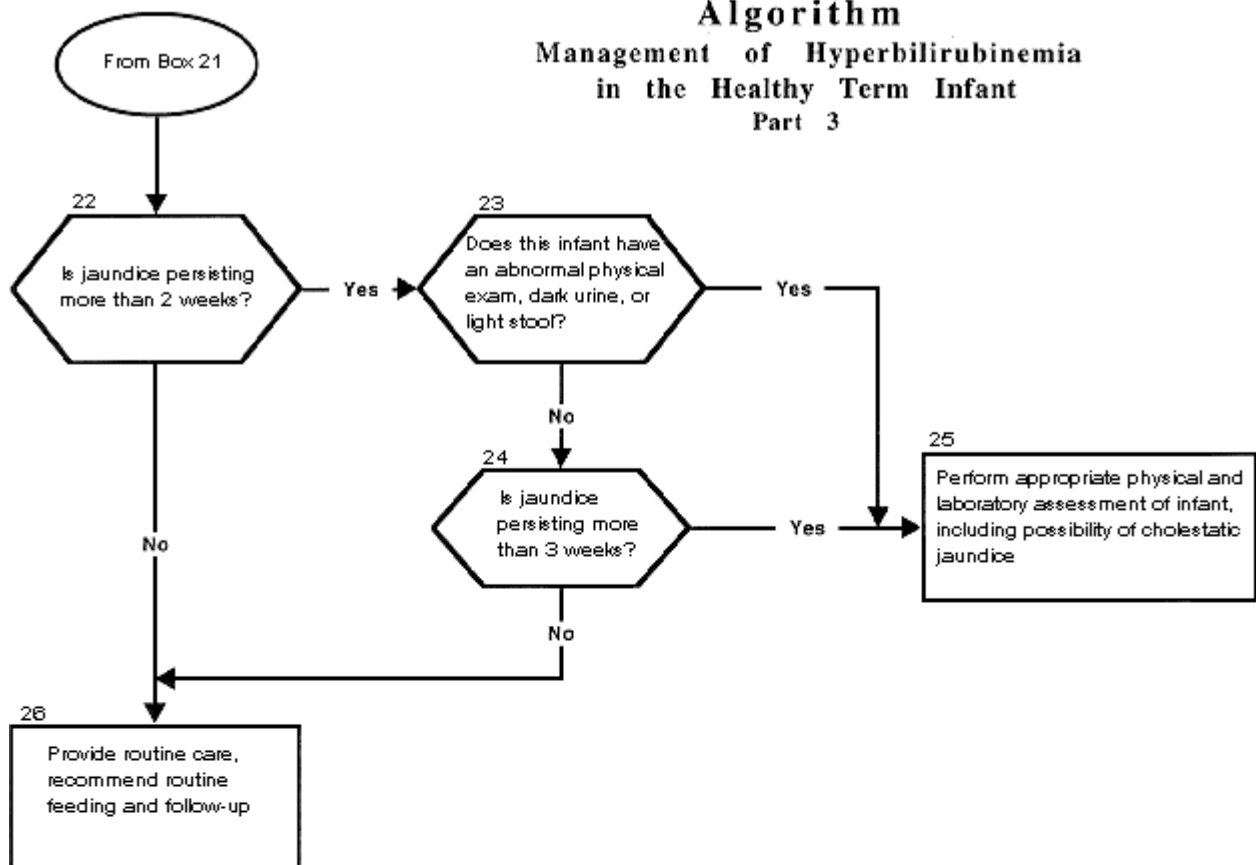


Algorithm Management of Hyperbilirubinemia in the Healthy Term Infant Part 2





Algorithm Management of Hyperbilirubinemia in the Healthy Term Infant Part 3



TSB Level, mg/dL (μmol/L)				
Age, hours	Consider phototherapy†	Phototherapy	Exchange Transfusion if Intensive Phototherapy Fails‡	Exchange Transfusion and Intensive Phototherapy
≤ 24	...	...	...	...
25-48	≥ 12(170)	≥ 15(260)	≥ 20(340)	≥ 25(430)
49-72	≥ 15(260)	≥ 18(310)	≥ 25(430)	≥ 30(510)
> 72	≥ 17(290)	≥ 20(340)	≥ 25(430)	≥ 30(510)

TSB LEVEL (mg/dL):[§]

* TSB indicates total serum bilirubin

† Phototherapy at these TSB levels is a clinical option, meaning that the intervention is available and may be used *on the basis of individual clinical judgment*. For a more detailed description of phototherapy see the Appendix.

‡ Intensive phototherapy (Appendix) should produce a decline of TSB of 1 to 2 mg/dL within 4 to 6 hours and the TSB level should continue to fall and remain below the threshold level for exchange transfusion. If this does not occur, it is considered a failure of phototherapy.

§ Term infants who are clinically jaundiced at ≤24 hours old are not considered healthy and require further evaluation (see text).

FIGURE. Management of hyperbilirubinemia in the healthy term newborn.

RICHTLIJNEN DIAGNOSTIEK

Bloedglucose bepaling

- Bij klachten als dorst, polyurie, vermagering, pruritis vulvae op oudere leeftijd
- Drie-jaarlijks bij spreekuurbezoekers >45 jr met
 - DM type 2 bij ouders, broers of zussen
 - hypertensie en/of manifeste hart- en vaatziekten (HVZ)
 - vetstofwisselingsstoornissen en/of obesitas (Quetelet index >27)
 - etnische belasting zoals Hindoestanen
 - zwangerschapsdiabetes in verleden of kinderen met geboortegewicht >4000 gr

Evaluatie		Capillair volbloed	Veneus plasma
Normaal:	nuchter glucose	< 5,6	< 6,1
	niet nuchter	< 7,8	< 7,8
Gestoord:	nuchter glucose	$\geq 5,6$ en $\leq 6,0$	$\geq 6,1$ en $\leq 6,9$
Diabetes mellitus:	nuchter glucose	> 6,0	> 6,9
	niet nuchter	> 11,0	> 11,0

- Verricht bij een waarde die duidt op DM een controlebepaling in nuchtere toestand enkele dagen later.

Risico-inventarisatie

- Vraag naar cardiovasculaire pathologie bij patiënt zelf of CHZ bij ouders, broers of zussen < 60 jaar
- Voedingsgewoontes, roken, alcoholgebruik, lichaamsbeweging
- Quetelet index (QI), bloeddruk; <50 jr albumineconcentratie of albumine/kreatinine ratio in eerste ochtend-urine
- GlyHb, totaal cholesterol, HDL-cholesterol, triglyceriden, kreatinine.
- Voetonderzoek; binnen 6 maanden onderzoek naar diabetische retinopathie

RICHTLIJNEN BELEID

Educatie:

Geef informatie over belangrijkste aspecten van DM en situaties waarbij maatregelen vereist zijn

Streefwaarden bloedglucoseregeling (glucosewaarden in capillair vol bloed)

	goed	aanvaardbaar	slecht
nuchter glucose (mmol/l)	4-7	7 - 8	> 8
glucose 2 uur post prandiaal (mmol/l)	< 9	9 - 10	> 10
glyHb (%)	< 7	7 - 8.5	> 8.5

Stap 1: verwijst naar diëtist; controleer na 3 maanden bloedglucose

Stap 2: geef bij falen stap 1 bij QI <27 sulfonyleureumderivaat (bijv. tolbutamide, 500 mg 1 dd, max. 1000 mg 2 dd) en bij QI > 27 metformine (500 mg 1 dd, max. 1000 mg 3 dd); start met laagste dosis, verhoog per 2-4 wkn tot streefwaarde bloedglucose

Stap 3: geef bij falen stap 2 combinatie van sulfonyleureumderivaat en metformine. Bij contra-indicaties of bijwerkingen: vervang betreffende middel door acarbose (50 mg 3 dd, max. 200 mg 3 dd).

Combinatie van drie soorten orale medicatie wordt niet aanbevolen

Driemaandelijke controle

- welbevinden, eventuele hypoglycemie, problemen met voedingsadvies en medicatie
- lichaamsgewicht, nuchtere bloedglucose of (bij insulinegebruikers) 4-punts-dagcurve. Bij voetproblemen: voetonderzoek

Jaarlijkse controle

- idem als driemaandelijke controle plus visusproblemen, cardiovasculaire problemen, neuropathie, seksuele problemen
- gewicht en bloeddruk; voetonderzoek en bij insuline-gebruikers spuitplaatsen
- nuchter glucose, glyHb%, kreatinine; bij geen gebruik van cholesterolsyntheseremmers totaalcholesterol, HDL-cholesterol, triglyceriden; bij patiënten <50jr albumineconcentratie of albumine/kreatinineratio in eerste ochtend-urine; funduscopie

Behandeling met insuline (facultatief)

Start met insuline bij onvoldoende regulatie met orale middelen. Leer patiënt vooraf zelfcontroles. Geef instructies over beleid bij hypoglycemie. Verwijs zo nodig naar diëtist

- Insuline plus orale antidiabetica
 - maak 4-puntsdagcurve (nuchter en 2 uur na de 3 hoofdmaaltijden)
 - voeg aan orale medicatie 8-12E middellang werkend NPH-insuline toe, toe te dienen voor het slapen gaan
 - controleer na 2-3 dgn; pas dosering met 2-4E aan op grond van nuchtere glucose
 - ga over op 2 dd NPH-insuline bij >40E insuline per dag om nuchtere waarde <7,0 mmol/l te krijgen of bij aanzienlijke postprandiale hyperglycemie op 4-puntsdagcurve. Stop tabletten, vervroeg avondinjectie naar vóór het avondeten en voeg 8-12 E vóór ontbijt toe
 - pas ochtenddosering verder aan op geleide van postprandiale glucose
 - bij onvoldoende correctie van de postprandiale waarden ander insulineregime
- Uitsluitend insuline

- stop orale medicatie. Gebruik middellang werkend NPH-insuline of mengsel van kort-/middellangwerkend (30/70) insuline
- begin met 12 E insuline vóór ontbijt, 6 E insuline vóór avondeten
- pas beide doseringen per 2-3 dagen met 2-4 E aan op grond van het nuchtere glucose en postprandiale waarden tot bereiken streefwaarden

Behandeling van andere risicofactoren voor hart- en vaatziekten

- Adviseer bij roken te stoppen
- Streef naar bloeddruk van 150/85 of lager. Stap 1: thiazide in lage dosis zoals hydrochloorthiazide of chloortalidon 12,5 mg. Stap 2: voeg zo nodig ACE-remmer of bètablokker toe. Stap 3: combinatie van thiazide, ACE-remmer en bètablokker. Zie NHG-Standaard Hypertensie
- Geef bij vetstofwisselingsstoornis cholesterolsyntheseremmer bij levensverwachting >5 jr en kans op CHZ >25% in 10 jaar; dit zijn bijv. alle patiënten met totaalcholesterol >5,0 mmol/l en manifest HVZ (bij afwezigheid van HVZ zie ['Risicotabel'](#) voor personen zonder HVZ)

Start laag, hoog dosis op tot bereiken streefwaarde totaalcholesterol (≤ 5 mmol/l) of maximumdosis. Zie ook NHG-Standaard Cholesterol

- Behandel patiënten <50 jaar met micro-albuminurie ongeacht hun tensie met ACE-remmer. Hoog dosering geleidelijk op tot bereiken tensie van 140/80 of maximum dosis ACE-remmer

Beleid bij intercurrente ziekten:

bij koorts, braken of diarree extra vochtinname (bouillon), tijdelijke verhoging van bloedglucose verlagende therapie op basis van de bloedglucose. Insuline nooit staken, ook niet bij minder eten

Beleid bij hypoglycemisch coma:

20-40 ml 50% glucoseoplossing iv of 1 mg glucagon sc of im. Bij terugkeer bewustzijn koolhydraatrijke voeding, ga oorzaak hypoglycemie na

Consultatie en verwijzen

- Eventueel voor instelling op insuline
- Te hoge postprandiale waarden ondanks twee dd insuline
- Diabetisch ulcus dat niet binnen 2 weken geneest
- Serumkreatinine >200 micromol/l of klaring < 30 ml/min
- Bij ernstige hyperglycemie (sufheid, dehydratie of braken): overleg met tweede lijn. Bij hyperglycemisch coma: opname
- Bij onvoldoende herstel bij hypoglycemisch coma na 1/2 uur

Verwijs naar podo-therapeut of pedicure met diabetesaantekening bij drukplekken, eeltvorming,

standsafwijkingen

Verwijs zo nodig naar diabetes verpleegkundige voor het aanleren van zelfcontroles of bij overzetting op insuline

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```

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<!-- edited with XML Spy v4.0.1 U (http://www.xmlspy.com) by Mar Marcos
Lopez (Vrije Universiteit Amsterdam) -->
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- <plan-library>
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- <domain name="Jaundice">
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- <qualitative-scale-def name="boolean">
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- <qualitative-scale-def name="bloodtype-scale">
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- <qualitative-scale-def name="rhesustype-scale">
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- <parameter-def name="age-child" type="time" required="no">
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- <parameter-def name="age" type="age-scale" required="no">

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- <parameter-def name="TSB-value" type="amount" required="no">
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- <parameter-def name="bilirubin" type="bilirubin-scale"
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- <parameter-def name="TSB-change" type="amount"
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- <change-def>
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    </interval>
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    required="no">
- <qualitative-parameter-def use-as-context="no">
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</parameter-def>
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- <parameter-group title="Other raw parameters">
- <parameter-def name="birth-date" type="date" required="no">
    <raw-data-def mode="manual" user-text="What is the birth
        date?" use-as-context="no" />
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- <parameter-def name="physical-exam-OK" type="boolean"
    required="no">
    <raw-data-def mode="manual" user-text="Is the physical exam
        OK?" use-as-context="no" />
</parameter-def>
- <parameter-def name="colour-stools" type="string" required="no">
    <raw-data-def mode="manual" user-text="What is the colour of
        the stools?" use-as-context="no" />
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- <parameter-def name="colour-urine" type="string" required="no">
    <raw-data-def mode="manual" user-text="What is the colour of
        the urine?" use-as-context="no" />
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- <parameter-def name="direct-serum-bilirubin" type="amount"
    required="no">
    <raw-data-def mode="manual" unit="mgdl" user-text="What is
        the value of direct serum bilirubin?" use-as-context="no" />
</parameter-def>
- <parameter-def name="total-urine-bilirubin" type="amount"
    required="no">

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    <raw-data-def mode="manual" unit="mgdl" user-text="What is
      the value of total urine bilirubin?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="term-child" type="boolean" required="no">
    <raw-data-def mode="manual" user-text="Is the gestational
      age of the child smaller than 37 w?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="lethargy" type="boolean" required="no">
    <raw-data-def mode="manual" user-text="Has the child
      lethargy?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="apnea" type="boolean" required="no">
    <raw-data-def mode="manual" user-text="Has the child
      apnea?" use-as-context="no" />
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- <parameter-def name="tachypnea" type="boolean" required="no">
    <raw-data-def mode="manual" user-text="Has the child
      tachypnea?" use-as-context="no" />
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- <parameter-def name="instable-temperature" type="boolean"
    required="no">
    <raw-data-def mode="manual" user-text="Has the child
      instable temperature?" use-as-context="no" />
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- <parameter-def name="behavior-changes" type="boolean"
    required="no">
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      behavior changes?" use-as-context="no" />
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- <parameter-def name="hepatosplenomegaly" type="boolean"
    required="no">
    <raw-data-def mode="manual" user-text="Has the child
      hepatosplenomegaly?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="vomitting" type="boolean" required="no">
    <raw-data-def mode="manual" user-text="In the child
      vomitting?" use-as-context="no" />
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- <parameter-def name="feeding-difficulty" type="boolean"
    required="no">
    <raw-data-def mode="manual" user-text="Has the child
      feeding difficulties?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="excessive-weight-loss" type="boolean"
    required="no">
    <raw-data-def mode="manual" user-text="Has the child
      excessive weight loss?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="bloodtype-mother" type="bloodtype-scale"
    required="no">
    <raw-data-def mode="manual" user-text="What is the blood
      type of the mother?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="rhesustype-mother" type="rhesustype-
    scale" required="no">
    <raw-data-def mode="manual" user-text="What is the rhesus
      type of the mother?" use-as-context="no" />

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</parameter-def>
- <parameter-def name="serum-isoimmune-antibodies-mother"
  type="boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the mother's
    blood isoimmune antibodies?" use-as-context="no" />
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- <parameter-def name="bloodtype-child" type="bloodtype-scale"
  required="no">
  <raw-data-def mode="manual" user-text="What is the blood
    type of the child?" use-as-context="no" />
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- <parameter-def name="rhesustype-child" type="rhesustype-scale"
  required="no">
  <raw-data-def mode="manual" user-text="What is the rhesus
    type of the child?" use-as-context="no" />
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- <parameter-def name="direct-Coombs-test" type="rhesustype-
  scale" required="no">
  <raw-data-def mode="manual" user-text="What is the result of
    the direct Coombs test of the child?" use-as-context="no" />
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- <parameter-def name="family-history" type="boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the child a
    family history of early jaundice or hemolytic anemia?" use-
    as-context="no" />
</parameter-def>
- <parameter-def name="ethnic-origin" type="boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the child an
    ethnic origin associated with hemolytic anemia?" use-as-
    context="no" />
</parameter-def>
- <parameter-def name="geographic-origin" type="boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the child a
    geographic origin associated with hemolytic anemia?" use-
    as-context="no" />
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- <parameter-def name="early-jaundice" type="boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Is there an early
    jaundice?" use-as-context="no" />
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- <parameter-def name="pallor" type="boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the child
    pallor?" use-as-context="no" />
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- <parameter-def name="breastfed-child" type="boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Is the child
    breastfed?" use-as-context="no" />
</parameter-def>
</parameter-group>
- <parameter-group title="Boolean parameters (they are asked) storing
  diagnostic information">
- <parameter-def name="jaundice-clinically-significant"
  type="boolean" required="no">

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    <raw-data-def mode="manual" user-text="Is there a clinically
    significant jaundice?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="par-possibility-of-hemolytic-disease"
  type="boolean" required="no">
    <raw-data-def mode="manual" user-text="Is there a possibility
    of hemolytic disease?" use-as-context="no" />
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</parameter-group>
<!-- Boolean variables (they are set) storing diagnostic
information -->
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  type="boolean" rounding="nearest" scalar-or-not="scalar" />
<variable-def name="possibility-of-G6PD" type="boolean"
  rounding="nearest" scalar-or-not="scalar" />
<variable-def name="possibility-of-cholestatic-disease"
  type="boolean" rounding="nearest" scalar-or-not="scalar" />
<variable-def name="possibility-of-other-diseases" type="boolean"
  rounding="nearest" scalar-or-not="scalar" />
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  type="boolean" rounding="nearest" scalar-or-not="scalar" />
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  rounding="nearest" scalar-or-not="scalar" />
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  rounding="nearest" scalar-or-not="scalar" />
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- <plan-group>
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- <intentions>
- <intention type="intermediate-state" verb="avoid">
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
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</intentions>
- <conditions>
- <abort-condition>
- <simple-condition>
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- <left-hand-side>
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- <right-hand-side>
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```

```

        </right-hand-side>
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</conditions>
- <plan-body>
- <subplans type="unordered" wait-for-optional-subplans="yes"
  retry-aborted-subplans="no">
- <wait-for>
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    Treatment-hyperbilirubinemia" />
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- <plan-activation>
  <plan-schema name="Check-for-rapid-TSB-increase" />
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- <plan-activation>
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- <plan-activation>
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</plan>
- <plan name="Check-for-rapid-TSB-increase">
- <intentions>
- <intention type="overall-state" verb="achieve">
- <simple-condition>
- <simple-condition-combination type="and">
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  <is-known-variable name="possibility-of-hemolytic-
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  </simple-condition-combination>
</simple-condition>
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</intentions>
- <conditions>
- <filter-precondition>
- <constraint-combination type="and">
- <parameter-proposition parameter-name="TSB-
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- <value-description type="equal">
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```

```

    </parameter-proposition>
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          - <right-hand-side>
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            G6PD" />
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      - <else-branch>
        - <variable-assignment variable="possibility-of-
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        </variable-assignment>
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          <plan-schema name="Exit-possibility-of-
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        </plan-activation>
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  </subplans>
</plan-body>

```

```

        </if-then-else>
    </subplans>
</plan-body>
</plan>
- <plan name="Exit-possibility-of-G6PD" title="Exit this protocol.
  Perform appropriate laboratory assessment (possibility of
  hemolytic disease, probably caused by G6PD).">
  - <plan-body>
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- <plan name="Exit-possibility-of-hemolytic-disease" title="Exit this
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  of hemolytic disease).">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Check-for-jaundice-after-2-weeks">
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  </intentions>
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                  unit="w" value="2" />
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            </starting-shift>
            - <finishing-shift include-limit-value="yes">
              - <earliest>
                <numerical-constant scale="time"
                  unit="w" value="2" />
              </earliest>
            </finishing-shift>
          </time-range>
          - <reference-point>
            <variable-ref name="birth-date" />
          </reference-point>
        </time-annotation>
      </parameter-proposition>
    </filter-precondition>
  </conditions>
</plan>

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    </parameter-proposition>
  </filter-precondition>
</conditions>
- <plan-body>
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    retry-aborted-subplans="no">
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    </wait-for>
    - <subplans type="any-order" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
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        <all />
      </wait-for>
      - <ask>
        <parameter-ref name="physical-exam-OK" />
      - <time-out>
        <now />
      </time-out>
      </ask>
      - <ask>
        <parameter-ref name="colour-stools" />
      - <time-out>
        <now />
      </time-out>
      </ask>
      - <ask>
        <parameter-ref name="colour-urine" />
      - <time-out>
        <now />
      </time-out>
      </ask>
    </subplans>
  - <if-then-else>
    - <simple-condition>
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            <parameter-ref name="physical-exam-
              OK" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="no" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="colour-stools" />
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          - <right-hand-side>
            <string-constant value="light" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
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            <parameter-ref name="colour-urine" />

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        </left-hand-side>
        - <right-hand-side>
            <string-constant value="dark" />
        </right-hand-side>
    </comparison>
</simple-condition-combination>
</simple-condition>
- <then-branch>
    - <ask>
        <parameter-ref name="direct-serum-
            bilirubin" />
        - <time-out>
            <now />
        </time-out>
    </ask>
    - <variable-assignment variable="possibility-of-
        cholestatic-disease">
        <qualitative-constant value="yes" />
    </variable-assignment>
    - <plan-activation>
        <plan-schema name="Exit-possibility-of-
            cholestatic-jaundice" />
    </plan-activation>
</then-branch>
- <else-branch>
    - <variable-assignment variable="possibility-of-
        cholestatic-disease">
        <qualitative-constant value="no" />
    </variable-assignment>
    - <plan-activation>
        <plan-schema name="Exit-provide-routine-
            care" />
    </plan-activation>
</else-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Exit-possibility-of-cholestatic-jaundice" title="Perform
    appropriate laboratory assessment, including possibility of
    cholestatic jaundice.">
    - <plan-body>
        <user-performed />
    </plan-body>
</plan>
- <plan name="Exit-provide-routine-care" title="Provide routine care,
    recommend routine feeding and follow-up.">
    - <plan-body>
        <user-performed />
    </plan-body>
</plan>
- <plan name="Check-for-jaundice-after-3-weeks">
    - <intentions>
        - <intention type="overall-state" verb="achieve">
            - <simple-condition>
                <is-known-variable name="possibility-of-cholestatic-

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        disease" />
    </simple-condition>
</intention>
</intentions>
- <conditions>
- <filter-precondition>
- <parameter-proposition parameter-name="jaundice-
    clinically-significant">
- <value-description type="equal">
    <constant-ref name="yes" />
    </value-description>
- <context>
    <any />
    </context>
- <time-annotation>
- <time-range>
- <starting-shift include-limit-value="yes">
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        unit="w" value="3" />
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    </starting-shift>
- <finishing-shift include-limit-value="yes">
- <earliest>
    <numerical-constant scale="time"
        unit="w" value="3" />
    </earliest>
    </finishing-shift>
    </time-range>
- <reference-point>
    <variable-ref name="birth-date" />
    </reference-point>
    </time-annotation>
    </parameter-proposition>
    </filter-precondition>
</conditions>
- <plan-body>
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- <subplans type="any-order" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
- <wait-for>
    <all />
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- <ask>
    <parameter-ref name="TSB-value" />
- <time-out>
    <now />
    </time-out>
    </ask>
- <ask>
    <parameter-ref name="direct-serum-bilirubin" />
- <time-out>

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        <now />
      </time-out>
    </ask>
  - <ask>
    <parameter-ref name="total-urine-bilirubin" />
  - <time-out>
    <now />
  </time-out>
</ask>
</subplans>
- <variable-assignment variable="possibility-of-cholestatic-
  disease">
  <qualitative-constant value="yes" />
</variable-assignment>
- <plan-activation>
  <plan-schema name="Exit-possibility-of-cholestatic-
    jaundice" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Diagnostics-and-Treatment-hyperbilirubinemia">
  - <intentions>
    - <intention type="intermediate-state" verb="avoid">
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="bilirubin" />
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          - <right-hand-side>
            <constant-ref name="transfusion" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </intention>
  </intentions>
  - <conditions>
    - <complete-condition>
      - <constraint-combination type="or">
        - <simple-condition>
          <explanation text="Follow this infant into routine
            clinical supervision." />
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="jaundice-clinically-
              significant" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="no" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    - <plan-state-constraint state="completed">
      - <plan-pointer instance-type="first" instance-
        number="1">
        <static-plan-pointer plan-name="Treatment-

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        hyperbilirubinemia" />
    </plan-pointer>
    - <time-annotation>
        <now />
    </time-annotation>
    </plan-state-constraint>
</constraint-combination>
</complete-condition>
- <abort-condition>
- <constraint-combination type="or">
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        <explanation text="Exiting the protocol to
        individualized clinical evaluation, including
        assessment of jaundice in light of
        prematurity." />
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            <parameter-ref name="term-child" />
        </left-hand-side>
        - <right-hand-side>
            <qualitative-constant value="no" />
        </right-hand-side>
        </comparison>
    </simple-condition>
    - <simple-condition>
        <explanation text="Exiting the protocol to
        individualized clinical evaluation, including
        assessment of jaundice and non-isoimmune
        hemolytic disease." />
    - <comparison type="equal">
        - <left-hand-side>
            <parameter-ref name="age" />
        </left-hand-side>
        - <right-hand-side>
            <qualitative-constant value="day1" />
        </right-hand-side>
        </comparison>
    </simple-condition>
    - <simple-condition>
        - <comparison type="equal">
            - <left-hand-side>
                <variable-ref name="pathologic-reason" />
            </left-hand-side>
            - <right-hand-side>
                <qualitative-constant value="yes" />
            </right-hand-side>
            </comparison>
        </simple-condition>
    </constraint-combination>
</abort-condition>
</conditions>
- <plan-body>
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    retry-aborted-subplans="no">
        - <wait-for>
            <none />

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    </wait-for>
  - <ask>
    <parameter-ref name="term-child" />
    - <time-out>
      <now />
    </time-out>
  </ask>
  - <ask>
    <parameter-ref name="age-child" />
    - <time-out>
      <now />
    </time-out>
  </ask>
  - <plan-activation>
    <plan-schema name="Diagnostics-
      hyperbilirubinemia" />
  </plan-activation>
  - <plan-activation>
    <plan-schema name="Treatment-
      hyperbilirubinemia" />
  </plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Diagnostics-hyperbilirubinemia">
  - <intentions>
    - <intention type="overall-state" verb="achieve">
      - <constraint-combination type="and">
        - <simple-condition>
          <is-known-variable name="pathologic-reason" />
        </simple-condition>
        - <parameter-proposition parameter-name="jaundice-
          clinically-significant">
          <is-known-parameter />
        - <context>
          <any />
        </context>
        - <time-annotation>
          <now />
        </time-annotation>
      </parameter-proposition>
    </constraint-combination>
  </intention>
</intentions>
  - <plan-body>
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      retry-aborted-subplans="no">
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        <all />
      </wait-for>
      - <variable-assignment variable="pathologic-reason">
        <qualitative-constant value="no" />
      </variable-assignment>
    - <plan-activation>
      <plan-schema name="Anamnesis-abnormal-signs" />
    </plan-activation>
  </subplans>
</plan-body>
</plan>

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- <plan-activation>
  <plan-schema name="Blood-tests" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Anamnesis-hemolytic-
    disease" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Jaundice-determination" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Anamnesis-abnormal-signs">
- <intentions>
- <intention type="overall-state" verb="achieve">
- <simple-condition>
  <is-known-variable name="possibility-of-other-
    diseases" />
</simple-condition>
</intention>
</intentions>
- <conditions>
- <abort-condition>
- <simple-condition>
  <explanation text="Exiting the protocol to
    individualized clinical evaluation, including
    assessment of jaundice and underlying disease." />
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="pathologic-reason" />
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- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
</simple-condition>
</abort-condition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
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- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="lethargy" />
- <time-out>
  <now />
</time-out>
</ask>

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- <ask>
 - <parameter-ref name="apnea" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="tachypnea" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="instable-temperature" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="behavior-changes" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="hepatosplenomegaly" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="vomitting" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="feeding-difficulty" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- <ask>
 - <parameter-ref name="excessive-weight-loss" />
- <time-out>
 - <now />
- </time-out>
- </ask>
- </subplans>
- <if-then-else>
 - <simple-condition>
 - <simple-condition-combination type="or">
 - <comparison type="equal">
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 - <parameter-ref name="lethargy" />
 - </left-hand-side>

- <right-hand-side>
 - <qualitative-constant value="yes" />
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- </comparison>
- <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="apnea" />
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 - <right-hand-side>
 - <qualitative-constant value="yes" />
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- <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="tachypnea" />
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 - <right-hand-side>
 - <qualitative-constant value="yes" />
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- <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="instable-temperature" />
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 - <right-hand-side>
 - <qualitative-constant value="yes" />
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- <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="behavior-changes" />
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 - <right-hand-side>
 - <qualitative-constant value="yes" />
</right-hand-side>
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- <comparison type="equal">
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 - <parameter-ref name="hepatosplenomegaly" />
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 - <right-hand-side>
 - <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="vomitting" />
</left-hand-side>
 - <right-hand-side>
 - <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">

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- <left-hand-side>
  <parameter-ref name="feeding-
    difficulty" />
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- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="excessive-
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  - <right-hand-side>
    <qualitative-constant value="yes" />
    </right-hand-side>
  </comparison>
</simple-condition-combination>
</simple-condition>
- <then-branch>
  - <variable-assignment variable="possibility-of-other-
    diseases">
    <qualitative-constant value="yes" />
    </variable-assignment>
  </then-branch>
- <else-branch>
  - <variable-assignment variable="possibility-of-other-
    diseases">
    <qualitative-constant value="no" />
    </variable-assignment>
  </else-branch>
</if-then-else>
- <if-then-else>
  - <simple-condition>
    - <comparison type="equal">
      - <left-hand-side>
        <variable-ref name="possibility-of-other-
          diseases" />
        </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="yes" />
        </right-hand-side>
      </comparison>
    </simple-condition>
  - <then-branch>
    - <variable-assignment variable="pathologic-reason">
      <qualitative-constant value="yes" />
      </variable-assignment>
    </then-branch>
  </if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Blood-tests">
  - <plan-body>
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        mother" />
      <static-plan-pointer plan-name="Perform-blood-test-
        child" />
    </wait-for-group>
  </wait-for>
  - <plan-activation>
    <plan-schema name="Check-blood-test-mother" />
  </plan-activation>
  - <plan-activation>
    <plan-schema name="Perform-blood-test-child" />
  </plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Check-blood-test-mother">
  - <intentions>
    - <intention type="overall-state" verb="achieve">
      - <simple-condition>
        <is-known-variable name="consider-holding-cord-
          blood" />
      </simple-condition>
    </intention>
  </intentions>
  - <conditions>
    - <filter-precondition>
      - <constraint-combination label="blood-test-mother-
        available" type="and">
        - <parameter-proposition parameter-name="bloodtype-
          mother">
          <is-known-parameter />
        - <context>
          <any />
        </context>
      - <time-annotation>
        <now />
      </time-annotation>
    </parameter-proposition>
      - <parameter-proposition parameter-name="rhesustype-
        mother">
        <is-known-parameter />
      - <context>
        <any />
      </context>
      - <time-annotation>
        <now />
      </time-annotation>
    </parameter-proposition>
      - <parameter-proposition parameter-name="serum-
        isoimmune-antibodies-mother">
        <is-known-parameter />
      - <context>
        <any />
    </context>
  </filter-precondition>
    </conditions>
  </plan>

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    </context>
  - <time-annotation>
    <now />
  </time-annotation>
</parameter-proposition>
</constraint-combination>
</filter-precondition>
</conditions>
- <plan-body>
- <if-then-else>
  - <simple-condition>
    - <simple-condition-combination type="or">
      - <simple-condition-combination type="and">
        - <comparison type="equal">
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            <parameter-ref name="rhesustype-
              mother" />
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          - <right-hand-side>
            <qualitative-constant value="positive" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="serum-
              isoimmune-antibodies-mother" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="negative" />
          </right-hand-side>
        </comparison>
      </simple-condition-combination>
    - <comparison type="equal">
      - <left-hand-side>
        <parameter-ref name="bloodtype-
          mother" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="O" />
      </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition>
- <then-branch>
  - <variable-assignment variable="consider-holding-cord-
    blood">
    <qualitative-constant value="yes" />
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  - <plan-activation>
    <plan-schema name="Consider-holding-cord-
      blood" />
  </plan-activation>
</then-branch>
- <else-branch>
  - <variable-assignment variable="consider-holding-cord-
    blood">

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        <qualitative-constant value="no" />
      </variable-assignment>
    </else-branch>
  </if-then-else>
</plan-body>
</plan>
- <plan name="Consider-holding-cord-blood" title="Consider holding
  infant's cord blood in a blood bank in case future testing is
  necessary">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Perform-blood-test-child">
  - <intentions>
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      - <constraint-combination type="and">
        - <parameter-proposition parameter-name="bloodtype-
          child">
          <is-known-parameter />
        - <context>
          <any />
        </context>
        - <time-annotation>
          <now />
        </time-annotation>
      </parameter-proposition>
      - <parameter-proposition parameter-name="rhesustype-
        child">
        <is-known-parameter />
        - <context>
          <any />
        </context>
        - <time-annotation>
          <now />
        </time-annotation>
      </parameter-proposition>
      - <simple-condition>
        <is-known-variable name="possibility-of-
          isoimmune-hemolytic-disease" />
      </simple-condition>
    </constraint-combination>
  </intention>
</intentions>
- <conditions>
  - <filter-precondition>
    - <constraint-combination type="or">
      - <constraint-not>
        <refer-to label="blood-test-mother-available" plan-
          name="Check-blood-test-mother" />
      </constraint-not>
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="rhesustype-
              mother" />

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        </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="negative" />
      </right-hand-side>
    </comparison>
  </simple-condition>
- <simple-condition>
  - <comparison type="equal">
    - <left-hand-side>
      <parameter-ref name="serum-isoimmune-
        antibodies-mother" />
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    - <right-hand-side>
      <qualitative-constant value="positive" />
    </right-hand-side>
  </comparison>
</simple-condition>
</constraint-combination>
</filter-precondition>
- <abort-condition>
- <simple-condition>
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    individualized clinical evaluation, including
    assessment of jaundice and isoimmune hemolytic
    disease (positive Coombs test)." />
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  - <right-hand-side>
    <qualitative-constant value="yes" />
  </right-hand-side>
</comparison>
</simple-condition>
</abort-condition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
  - <wait-for>
    <all />
  </wait-for>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
  - <wait-for>
    <all />
  </wait-for>
  - <ask>
    <parameter-ref name="bloodtype-child" />
    - <time-out>
      <now />
    </time-out>
  </ask>
  - <ask>
    <parameter-ref name="rhesustype-child" />
    - <time-out>

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        <now />
    </time-out>
</ask>
- <ask>
    <parameter-ref name="direct-Coombs-test" />
    - <time-out>
        <now />
    </time-out>
</ask>
</subplans>
- <if-then-else>
    - <simple-condition>
        - <comparison type="equal">
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                <parameter-ref name="direct-Coombs-
                    test" />
            </left-hand-side>
            - <right-hand-side>
                <qualitative-constant value="positive" />
            </right-hand-side>
        </comparison>
    </simple-condition>
    - <then-branch>
        - <variable-assignment variable="possibility-of-
            isoimmune-hemolytic-disease">
            <qualitative-constant value="yes" />
        </variable-assignment>
    </then-branch>
    - <else-branch>
        - <variable-assignment variable="possibility-of-
            isoimmune-hemolytic-disease">
            <qualitative-constant value="no" />
        </variable-assignment>
    </else-branch>
</if-then-else>
- <if-then-else>
    - <simple-condition>
        - <comparison type="equal">
            - <left-hand-side>
                <variable-ref name="possibility-of-
                    isoimmune-hemolytic-disease" />
            </left-hand-side>
            - <right-hand-side>
                <qualitative-constant value="yes" />
            </right-hand-side>
        </comparison>
    </simple-condition>
    - <then-branch>
        - <variable-assignment variable="pathologic-reason">
            <qualitative-constant value="yes" />
        </variable-assignment>
    </then-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>

```

- <plan name="Anamnesis-hemolytic-disease">
 - <intentions>
 - <intention type="overall-state" verb="achieve">
 - <simple-condition>
 - <simple-condition-combination type="and">
 - <is-known-variable name="possibility-of-hemolytic-disease" />
 - <is-known-variable name="possibility-of-inherited-disease" />
 - </simple-condition-combination>
 - </simple-condition>
 - </intention>
 - </intentions>
 - <conditions>
 - <abort-condition>
 - <simple-condition>
 - <explanation text="Exiting the protocol to individualized clinical evaluation, including assessment of jaundice and non-isoimmune hemolytic disease." />
 - <comparison type="equal">
 - <left-hand-side>
 - <variable-ref name="pathologic-reason" />
 - </left-hand-side>
 - <right-hand-side>
 - <qualitative-constant value="yes" />
 - </right-hand-side>
 - </comparison>
 - </simple-condition>
 - </abort-condition>
- </conditions>
- <plan-body>
 - <subplans type="sequentially" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <all />
 - </wait-for>
 - <subplans type="any-order" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <all />
 - </wait-for>
 - <ask>
 - <parameter-ref name="family-history" />
 - <time-out>
 - <now />
 - </time-out>
 - </ask>
 - <ask>
 - <parameter-ref name="ethnic-origin" />
 - <time-out>
 - <now />
 - </time-out>
 - </ask>
 - <ask>
 - <parameter-ref name="geographic-origin" />

```

- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="early-jaundice" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="pallor" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="hepatosplenomegaly" />
- <time-out>
  <now />
</time-out>
</ask>
</subplans>
- <if-then-else>
- <simple-condition>
- <simple-condition-combination type="or">
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="family-history" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="ethnic-origin" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="geographic-
    origin" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="early-jaundice" />
</left-hand-side>
- <right-hand-side>

```

```

        <qualitative-constant value="yes" />
      </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition>
- <then-branch>
- <plan-activation>
  <plan-schema name="Investigate-possibility-of-
    hemolytic-disease" />
</plan-activation>
- <ask>
  <parameter-ref name="par-possibility-of-
    hemolytic-disease" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <if-then-else>
- <simple-condition>
  - <comparison type="equal">
    - <left-hand-side>
      <parameter-ref name="par-
        possibility-of-hemolytic-
        disease" />
    </left-hand-side>
    - <right-hand-side>
      <qualitative-constant value="yes" />
    </right-hand-side>
  </comparison>
</simple-condition>
- <then-branch>
  - <variable-assignment variable="possibility-of-
    hemolytic-disease">
    <qualitative-constant value="yes" />
  </variable-assignment>
</then-branch>
</if-then-else>
</then-branch>
- <else-branch>
- <variable-assignment variable="possibility-of-
  hemolytic-disease">
  <qualitative-constant value="no" />
</variable-assignment>
</else-branch>
</if-then-else>
- <if-then-else>
- <simple-condition>
  - <comparison type="equal">
    - <left-hand-side>
      <parameter-ref name="ethnic-origin" />
    </left-hand-side>
    - <right-hand-side>
      <qualitative-constant value="yes" />
    </right-hand-side>
  </comparison>
</simple-condition>

```

```

- <then-branch>
- <variable-assignment variable="possibility-of-
  inherited-disease">
  <qualitative-constant value="yes" />
</variable-assignment>
</then-branch>
- <else-branch>
- <variable-assignment variable="possibility-of-
  inherited-disease">
  <qualitative-constant value="no" />
</variable-assignment>
</else-branch>
</if-then-else>
- <if-then-else>
- <simple-condition>
- <simple-condition-combination type="or">
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="possibility-of-
    hemolytic-disease" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="possibility-of-
    inherited-disease" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="yes" />
</right-hand-side>
</comparison>
</simple-condition-combination>
</simple-condition>
- <then-branch>
- <variable-assignment variable="pathologic-reason">
  <qualitative-constant value="yes" />
</variable-assignment>
</then-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Investigate-possibility-of-hemolytic-disease"
  title="Perform appropriate laboratory assessment of infant
  including (but not limited to): (1) complete blood count,
  differential smear, reticulocyte count; (2) G6PD screen; (3)
  hemoglobin electrophoresis.">
- <plan-body>
  <user-performed />
</plan-body>
</plan>
- <plan name="Jaundice-determination">
- <intentions>

```

- <intention type="overall-state" verb="achieve">
 - <parameter-proposition parameter-name="jaundice-clinically-significant">
 - <is-known-parameter />
 - <context>
 - <any />
 - </context>
 - <time-annotation>
 - <now />
 - </time-annotation>
 - </parameter-proposition>
- </intention>

- </intentions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <all />
 - </wait-for>
 - <subplans type="any-order" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <one />
 - </wait-for>
 - <plan-activation>
 - <plan-schema name="Blanching-skin-with-digital-pressure-test" />
 - </plan-activation>
 - <plan-activation>
 - <plan-schema name="Ictrometer-test" />
 - </plan-activation>
 - <plan-activation>
 - <plan-schema name="Transcutaneous-jaundice-meter-test" />
 - </plan-activation>
 - <plan-activation>
 - <plan-schema name="Determine-extent-cephalocaudad-progression" />
 - </plan-activation>
 - </subplans>
- <ask>
 - <parameter-ref name="jaundice-clinically-significant" />
 - <time-out>
 - <now />
 - </time-out>
- </ask>
- </subplans>
- </plan-body>
- </plan>
- <plan name="Blanching-skin-with-digital-pressure-test" title="Blanching sking with digital pressure test">
- <conditions>
 - <activate-mode started="manual" />
- </conditions>
- <plan-body>

```

        <user-performed />
    </plan-body>
</plan>
- <plan name="Icterometer-test" title="Icterometer test">
- <conditions>
    <activate-mode started="manual" />
</conditions>
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Transcutaneous-jaundice-meter-test"
    title="Transcutaneous jaundice meter test">
- <conditions>
    <activate-mode started="manual" />
</conditions>
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Determine-extent-cephalocaudad-progression"
    title="Determine extent cephalocaudad progression">
- <conditions>
    <activate-mode started="manual" />
</conditions>
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Treatment-hyperbilirubinemia">
- <intentions>
- <intention type="intermediate-state" verb="avoid">
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
    <parameter-ref name="bilirubin" />
</left-hand-side>
- <right-hand-side>
    <qualitative-constant value="transfusion" />
</right-hand-side>
</comparison>
</simple-condition>
</intention>
- <intention type="overall-state" verb="achieve">
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
    <parameter-ref name="bilirubin" />
</left-hand-side>
- <right-hand-side>
    <qualitative-constant value="observation" />
</right-hand-side>
</comparison>
</simple-condition>
</intention>
</intentions>

```

- <plan-body>
 - <subplans type="parallel" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <one />
 - <!-- ...which means: wait-for any-order block -->
 - </wait-for>
 - <subplans type="any-order" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <wait-for-group type="or">
 - <static-plan-pointer plan-name="Regular-treatments" />
 - <static-plan-pointer plan-name="Exchange-transfusion" />
 - </wait-for-group>
 - </wait-for>
 - <plan-activation>
 - <plan-schema name="Regular-treatments" />
 - <on-abort>
 - <plan-activation>
 - <plan-schema name="Exchange-transfusion" />
 - </plan-activation>
 - </on-abort>
 - </plan-activation>
- <plan-activation>
 - <plan-schema name="Exchange-transfusion" />
- </plan-activation>

- </subplans>
- <cyclical-plan>
- <cyclical-plan-body>
 - <subplans type="sequentially" wait-for-optional-subplans="no" retry-aborted-subplans="no">
 - <wait-for>
 - <all />
 - </wait-for>
 - <ask>
 - <parameter-ref name="TSB-value" />
 - <time-out>
 - <now />
 - </time-out>
 - </ask>
 - <ask>
 - <parameter-ref name="age-child" />
 - <time-out>
 - <now />
 - </time-out>
 - </ask>
- </subplans>
- </cyclical-plan-body>
- <repeat-specification>
- <retry-delay include-limit-value="yes">
 - <minimum>
 - <numerical-constant scale="time" unit="h" value="12" />

```

        </minimum>
      - <maximum>
        <numerical-constant scale="time" unit="h"
          value="24" />
        </maximum>
      </retry-delay>
    </repeat-specification>
  </cyclical-plan>
</subplans>
</plan-body>
</plan>
- <plan name="Regular-treatments">
  - <intentions>
    - <intention type="intermediate-state" verb="avoid">
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="bilirubin" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="transfusion" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </intention>
    - <intention type="overall-state" verb="achieve">
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="bilirubin" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="observation" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </intention>
  </intentions>
  - <conditions>
    - <filter-precondition>
      - <parameter-proposition parameter-name="bilirubin">
        - <value-description type="not-equal">
          <qualitative-constant value="transfusion" />
        </value-description>
      - <context>
        <any />
      </context>
      - <time-annotation>
        <now />
      </time-annotation>
    </parameter-proposition>
  </filter-precondition>
    - <abort-condition>
      - <constraint-combination type="or">
        - <parameter-proposition parameter-name="bilirubin">
          - <value-description type="equal">

```

```

        <qualitative-constant value="transfusion" />
    </value-description>
    - <context>
        <any />
    </context>
    - <time-annotation>
        <now />
    </time-annotation>
    </parameter-proposition>
    <refer-to label="intensive-photohterapy-failure" plan-
        name="Phototherapy-intensive" />
    </constraint-combination>
</abort-condition>
</conditions>
- <plan-body>
    - <subplans type="unordered" wait-for-optional-subplans="no"
        retry-aborted-subplans="no">
        - <wait-for>
            <all />
        </wait-for>
        - <plan-activation>
            <plan-schema name="Feeding-alternatives" />
        </plan-activation>
        - <subplans type="any-order" retry-aborted-subplans="yes"
            wait-for-optional-subplans="no">
            - <wait-for>
                <static-plan-pointer plan-name="Observation" />
            </wait-for>
            - <plan-activation>
                <plan-schema name="Phototherapy-intensive" />
            </plan-activation>
            - <plan-activation>
                <plan-schema name="Phototherapy-normal-
                    prescription" />
            </plan-activation>
            - <plan-activation>
                <plan-schema name="Phototherapy-normal-
                    recommendation" />
            </plan-activation>
            - <plan-activation>
                <plan-schema name="Observation" />
            </plan-activation>
        </subplans>
    </subplans>
</plan-body>
</plan>
- <plan name="Feeding-alternatives">
    - <plan-body>
        - <subplans type="sequentially" wait-for-optional-subplans="no"
            retry-aborted-subplans="no">
            - <wait-for>
                <all />
            </wait-for>
            - <ask>
                <parameter-ref name="breastfed-child" />
            - <time-out>

```

```

        <now />
      </time-out>
    </ask>
  - <if-then-else>
    - <simple-condition>
      - <comparison type="equal">
        - <left-hand-side>
          <parameter-ref name="breastfed-child" />
        </left-hand-side>
        - <right-hand-side>
          <qualitative-constant value="yes" />
        </right-hand-side>
      </comparison>
    </simple-condition>
    - <then-branch>
      - <plan-activation>
        <plan-schema name="Choose-feeding-
          alternative" />
      </plan-activation>
    </then-branch>
  </if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Choose-feeding-alternative">
  - <plan-body>
    - <subplans type="any-order" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <one />
      </wait-for>
      - <plan-activation>
        <plan-schema name="Breastfeeding" />
      </plan-activation>
      - <plan-activation>
        <plan-schema name="Breastfeeding-with-formula" />
      </plan-activation>
      - <plan-activation>
        <plan-schema name="Formula-only" />
      </plan-activation>
    </subplans>
  </plan-body>
</plan>
- <plan name="Breastfeeding" title="Breastfeeding">
  - <conditions>
    <activate-mode started="manual" />
  </conditions>
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Breastfeeding-with-formula" title="Breastfeeding with
  formula">
  - <conditions>
    <activate-mode started="manual" />
  </conditions>

```

```

- <plan-body>
  <user-performed />
</plan-body>
</plan>
- <plan name="Formula-only" title="Formula only">
- <conditions>
  <activate-mode started="manual" />
</conditions>
- <plan-body>
  <user-performed />
</plan-body>
</plan>
- <plan name="Phototherapy-intensive">
- <conditions>
- <filter-precondition>
- <constraint-combination type="or">
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="equal">
  <qualitative-constant value="phototherapy-
    intensive" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
<refer-to label="normal-phototherapy-failure" plan-
  name="Phototherapy-normal-prescription" />
</constraint-combination>
</filter-precondition>
- <abort-condition>
- <constraint-combination type="or">
- <constraint-combination type="and">
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="not-equal">
  <qualitative-constant value="phototherapy-
    intensive" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
<!-- ...I would have preferred constraint-not +
refer-to normal-phototherapy-failure here -->
- <constraint-not>
- <constraint-combination type="and">
- <parameter-proposition parameter-
  name="bilirubin">
- <value-description type="equal">
  <qualitative-constant
    value="phototherapy-normal" />

```

```

    </value-description>
  - <context>
    <any />
  </context>
  - <time-annotation>
    <now />
  </time-annotation>
</parameter-proposition>
- <parameter-proposition parameter-
  name="TSB-decrease">
  - <value-description type="equal">
    <qualitative-constant value="no" />
  </value-description>
  - <context>
    <any />
  </context>
  - <time-annotation>
    <now />
  </time-annotation>
</parameter-proposition>
</constraint-combination>
</constraint-not>
</constraint-combination>
- <constraint-combination label="intensive-phototherapy-
  failure" type="and">
  <explanation text="Failure of intensive
    phototherapy. Perform appropriate laboratory
    assessment (possibility of hemolytic
    disease)." />
  - <parameter-proposition parameter-name="bilirubin">
    - <value-description type="equal">
      <qualitative-constant value="phototherapy-
        intensive" />
    </value-description>
    - <context>
      <any />
    </context>
    - <time-annotation>
      <now />
    </time-annotation>
  </parameter-proposition>
  - <constraint-combination type="or">
    - <constraint-combination type="and">
      - <parameter-proposition parameter-
        name="TSB-decrease">
        - <value-description type="equal">
          <qualitative-constant value="yes" />
        </value-description>
        - <context>
          <any />
        </context>
        - <time-annotation>
          - <time-range>
            - <starting-shift include-limit-
              value="yes">
            - <earliest>

```

```

        <numerical-constant
          scale="time" unit="h"
          value="4" />
      </earliest>
    </starting-shift>
  - <finishing-shift include-limit-
    value="yes">
  - <latest>
    <numerical-constant
      scale="time" unit="h"
      value="6" />
    </latest>
  </finishing-shift>
</time-range>
<self />
</time-annotation>
</parameter-proposition>
- <parameter-proposition parameter-
  name="TSB-change">
  - <value-description type="less-than">
    <qualitative-constant value="1" />
  </value-description>
  - <context>
    <any />
  </context>
  - <time-annotation>
    - <time-range>
      - <starting-shift include-limit-
        value="yes">
      - <earliest>
        <numerical-constant
          scale="time" unit="h"
          value="4" />
        </earliest>
      </starting-shift>
      - <finishing-shift include-limit-
        value="yes">
      - <latest>
        <numerical-constant
          scale="time" unit="h"
          value="6" />
        </latest>
      </finishing-shift>
    </time-range>
    <self />
    </time-annotation>
  </parameter-proposition>
</constraint-combination>
- <parameter-proposition parameter-name="TSB-
  decrease">
  - <value-description type="equal">
    <qualitative-constant value="no" />
  </value-description>
  - <context>
    <any />
  </context>
  - <time-annotation>

```

```

- <time-range>
  - <starting-shift include-limit-
    value="yes">
    - <earliest>
      <numerical-constant
        scale="time" unit="h"
        value="4" />
      </earliest>
    </starting-shift>
  </time-range>
  <self />
</time-annotation>
</parameter-proposition>
</constraint-combination>
</constraint-combination>
</constraint-combination>
</abort-condition>
</conditions>
- <plan-body>
  - <plan-activation>
    <plan-schema name="Prescribe-intensive-
      phototherapy" />
    </plan-activation>
  </plan-body>
</plan>
- <plan name="Prescribe-intensive-phototherapy" title="Prescribe
  intensive phototherapy">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Phototherapy-normal-prescription">
  - <intentions>
    - <intention type="overall-state" verb="achieve">
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="bilirubin" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="observation" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </intention>
  </intentions>
  - <conditions>
    - <filter-precondition>
      - <parameter-proposition parameter-name="bilirubin">
        - <value-description type="equal">
          <qualitative-constant value="phototherapy-
            normal" />
        </value-description>
      - <context>
        <any />
      </context>
    </filter-precondition>
  </conditions>

```

```

- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</filter-precondition>
- <abort-condition>
- <constraint-combination type="or">
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="not-equal">
  <qualitative-constant value="phototherapy-
    normal" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
- <constraint-combination label="normal-phototherapy-
  failure" type="and">
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="equal">
  <qualitative-constant value="phototherapy-
    normal" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
<!-- To review! -->
- <parameter-proposition parameter-name="TSB-
  decrease">
- <value-description type="equal">
  <qualitative-constant value="no" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</constraint-combination>
</constraint-combination>
</abort-condition>
</conditions>
- <plan-body>
- <plan-activation>
  <plan-schema name="Prescribe-normal-phototherapy" />
</plan-activation>
</plan-body>
</plan>

```

```

- <plan name="Prescribe-normal-phototherapy" title="Prescribe
  normal phototherapy">
- <plan-body>
  <user-performed />
</plan-body>
</plan>
- <plan name="Phototherapy-normal-recommendation">
- <conditions>
- <filter-precondition>
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="equal">
  <qualitative-constant value="phototherapy-
    recommended" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</filter-precondition>
- <abort-condition>
- <parameter-proposition parameter-name="bilirubin">
- <value-description type="not-equal">
  <qualitative-constant value="phototherapy-
    recommended" />
</value-description>
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</abort-condition>
</conditions>
- <plan-body>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <one />
</wait-for>
- <plan-activation>
  <plan-schema name="Prescribe-observation-manual-
    activation" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Prescribe-normal-phototherapy-
    manual-activation" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Prescribe-observation-manual-activation"
  title="Prescribe observation">

```

- <conditions>
 - <activate-mode started="manual" />
</conditions>
- <plan-body>
 - <user-performed />
</plan-body>
- </plan>
- <plan name="Prescribe-normal-phototherapy-manual-activation"
 - title="Prescribe normal phototherapy">
 - <conditions>
 - <activate-mode started="manual" />
</conditions>
 - <plan-body>
 - <user-performed />
</plan-body>
 - </plan>
 - <plan name="Observation">
 - <intentions>
 - <intention type="intermediate-state" verb="maintain">
 - <simple-condition>
 - <comparison type="equal">
 - <left-hand-side>
 - <parameter-ref name="bilirubin" />
</left-hand-side>
 - <right-hand-side>
 - <qualitative-constant value="observation" />
</right-hand-side>
</comparison>
</simple-condition>
</intention>
</intentions>
 - <conditions>
 - <filter-precondition>
 - <parameter-proposition parameter-name="bilirubin">
 - <value-description type="equal">
 - <qualitative-constant value="observation" />
</value-description>
 - <context>
 - <any />
</context>
 - <time-annotation>
 - <now />
</time-annotation>
</parameter-proposition>
</filter-precondition>
 - <abort-condition>
 - <parameter-proposition parameter-name="bilirubin">
 - <value-description type="not-equal">
 - <qualitative-constant value="observation" />
</value-description>
 - <context>
 - <any />
</context>
 - <time-annotation>
 - <now />
</time-annotation>

```

        </parameter-proposition>
    </abort-condition>
</conditions>
- <plan-body>
    - <plan-activation>
        <plan-schema name="Prescribe-observation" />
    </plan-activation>
</plan-body>
</plan>
- <plan name="Prescribe-observation" title="Prescribe observation">
    - <plan-body>
        <user-performed />
    </plan-body>
</plan>
- <plan name="Exchange-transfusion">
    - <intentions>
        - <intention type="intermediate-state" verb="avoid">
            - <simple-condition>
                - <comparison type="equal">
                    - <left-hand-side>
                        <parameter-ref name="bilirubin" />
                    </left-hand-side>
                    - <right-hand-side>
                        <qualitative-constant value="transfusion" />
                    </right-hand-side>
                </comparison>
            </simple-condition>
        </intention>
        - <intention type="overall-state" verb="achieve">
            - <simple-condition>
                - <comparison type="not-equal">
                    - <left-hand-side>
                        <parameter-ref name="bilirubin" />
                    </left-hand-side>
                    - <right-hand-side>
                        <qualitative-constant value="transfusion" />
                    </right-hand-side>
                </comparison>
            </simple-condition>
        </intention>
    </intentions>
    - <conditions>
        - <filter-precondition>
            - <constraint-combination type="or">
                - <parameter-proposition parameter-name="bilirubin">
                    - <value-description type="equal">
                        <qualitative-constant value="transfusion" />
                    </value-description>
                - <context>
                    <any />
                </context>
                - <time-annotation>
                    <now />
                </time-annotation>
            </parameter-proposition>
            <refer-to label="intensive-phototherapy-failure" plan-

```

```

        name="Phototherapy-intensive" />
    </constraint-combination>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="parallel" wait-for-optional-subplans="no" retry-
  aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <plan-activation>
  <plan-schema name="Prescribe-intensive-
    phototherapy" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Prescribe-exchange-
    transfusion" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Prescribe-exchange-transfusion" title="Prescribe
  exchange transfusion">
- <plan-body>
  <user-performed />
</plan-body>
</plan>
</plan-group>
</plans>
</plan-library>

```

```

<?xml version="1.0" encoding="UTF-8" ?>
<!-- edited with XML Spy v4.0.1 U (http://www.xmlspy.com) by Mar Marcos
Lopez (Vrije Universiteit Amsterdam) -->
<!DOCTYPE plan-library (View Source for full doctype...)>
- <plan-library>
- <domain-defs>
  - <domain name="Diabetes-Mellitus-Domain">
    - <unit-def name="mmoll" precision-unit="mmol/l" rounding="nearest">
      - <compound-def>
        - <numerator>
          <unit-class name="amount" exponent="1" />
        </numerator>
        - <denominator>
          <unit-class name="volume" exponent="1" />
        </denominator>
      </compound-def>
    </unit-def>
    <!-- Qualitative scales -->
    - <qualitative-scale-def name="sex-scale">
      <qualitative-entry entry="male" />
      <qualitative-entry entry="female" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="glucose-evaluation-scale">
      <qualitative-entry entry="normal" />
      <qualitative-entry entry="disturbed" />
      <qualitative-entry entry="DMT2" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="glucose-measurement-type-scale">
      <qualitative-entry entry="blood" />
      <qualitative-entry entry="plasma" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="glucose-monitoring-scale">
      <qualitative-entry entry="good" />
      <qualitative-entry entry="acceptable" />
      <qualitative-entry entry="bad" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="insulin-type-scale">
      <qualitative-entry entry="mid-term" />
      <qualitative-entry entry="mix" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="insuline-intake-scale">
      <qualitative-entry entry="before-meal" />
      <qualitative-entry entry="after-meal" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="age-scale">
      <qualitative-entry entry="30ies-and-younger" />
      <qualitative-entry entry="40ies" />
      <qualitative-entry entry="50ies" />
      <qualitative-entry entry="60ies" />
      <qualitative-entry entry="70ies" />
      <qualitative-entry entry="80ies-and-older" />
    </qualitative-scale-def>
    - <qualitative-scale-def name="risk-scale">
      <qualitative-entry entry="non-significant" />
      <qualitative-entry entry="significant" />

```

```

</qualitative-scale-def>
<!-- Patient data (they are referred to but not explicitly
asked) -->
- <patient-record-def name="patient-data">
  <primary-key name="name" />
  <field-def default-unit="y" name="age" type="time"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="sex" type="sex-scale" rounding="nearest" scalar-
    or-not="scalar" />
  <field-def name="triennial-visit" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="alive" type="Boolean" rounding="nearest" scalar-
    or-not="scalar" />
  <field-def name="contraindications" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="side-effects" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <field-def name="cholesterol-treatment" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <!-- data for treatment of CV disease risk factors -->
  <field-def name="fever" type="Boolean" rounding="nearest" scalar-
    or-not="scalar" />
  <field-def name="vomiting" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <field-def name="diarrhea" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <field-def name="hypoglycemic-coma" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="insulin-adjustment-needed" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="diabetic-ulcus-after-2-weeks" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="lethargy" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <field-def name="dehydration" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <field-def name="hypoglycemic-coma-after-30-min"
    type="Boolean" rounding="nearest" scalar-or-not="scalar" />
  <!-- data for Cholesterol treatment -->
  <field-def name="fat-metabolism-problems" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def default-unit="y" name="life-expectancy" type="time"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="CV-diseases" type="Boolean" rounding="nearest"
    scalar-or-not="scalar" />
  <!-- data for Microalbuminuria treatment -->
  <field-def name="microalbuminuria" type="Boolean"
    rounding="nearest" scalar-or-not="scalar" />
  <field-def name="CH-disease-risk" type="risk-scale"
    rounding="nearest" scalar-or-not="scalar" />
</patient-record-def>
<!-- Parameters (they are asked and/or abstracted) -->
- <parameter-group title="Raw parameters and their abstractions">
  - <parameter-def name="fasting-glucose" type="mmoll"
    required="no">
    <raw-data-def mode="manual" use-as-context="no" />
  </parameter-def>

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- <parameter-def name="non-fasting-glucose" type="mmoll"
  required="no">
  <raw-data-def mode="manual" use-as-context="no" />
</parameter-def>
- <parameter-def name="glucose-measurement-type"
  type="glucose-measurement-type-scale" required="no">
  <raw-data-def mode="manual" use-as-context="no" />
</parameter-def>
- <parameter-def name="after-breakfast-glucose" type="mmoll"
  required="no">
  <raw-data-def mode="manual" use-as-context="no" />
</parameter-def>
- <parameter-def name="after-lunch-glucose" type="mmoll"
  required="no">
  <raw-data-def mode="manual" use-as-context="no" />
</parameter-def>
- <parameter-def name="after-dinner-glucose" type="mmoll"
  required="no">
  <raw-data-def mode="manual" use-as-context="no" />
</parameter-def>
<!-- Glucose evaluation -->
- <parameter-def name="fasting-glucose-evaluation"
  type="glucose-evaluation-scale" required="no">
- <qualitative-parameter-def use-as-context="no">
- <limits unit="mmoll">
- <context>
- <one-of name="glucose-measurement-type">
  <value-ref name="blood" />
</one-of>
</context>
<negative-infinite />
<limit-entry value="5.6" include-limit-value="yes" />
<limit-entry value="6" include-limit-value="yes" />
<positive-infinite />
</limits>
- <limits unit="mmoll">
- <context>
- <one-of name="glucose-measurement-type">
  <value-ref name="plasma" />
</one-of>
</context>
<negative-infinite />
<limit-entry value="6.1" include-limit-value="yes" />
<limit-entry value="6.9" include-limit-value="yes" />
<positive-infinite />
</limits>
<parameter-ref name="fasting-glucose" />
</qualitative-parameter-def>
</parameter-def>
- <parameter-def name="non-fasting-glucose-evaluation"
  type="glucose-evaluation-scale" required="no">
- <qualitative-parameter-def use-as-context="no">
- <limits>
- <context>
  <any />
</context>

```

```

        <negative-infinite />
        <limit-entry value="7.8" include-limit-value="yes" />
        <limit-entry value="11" include-limit-value="yes" />
        <positive-infinite />
    </limits>
    <!-- To review! -->
    <parameter-ref name="non-fasting-glucose" />
</qualitative-parameter-def>
</parameter-def>
- <parameter-def name="glucose-evaluation" type="glucose-
  evaluation-scale" required="no">
- <logical-dependency-def>
    <!-- one of the previous evaluations -->
    - <parameter-proposition parameter-name="fasting-glucose-
      evaluation">
        <is-known-parameter />
        - <context>
            <any />
        </context>
        - <time-annotation>
            <now />
        </time-annotation>
    </parameter-proposition>
    <parameter-ref name="fasting-glucose-evaluation" />
    - <parameter-proposition parameter-name="non-fasting-
      glucose-evaluation">
        <is-known-parameter />
        - <context>
            <any />
        </context>
        - <time-annotation>
            <now />
        </time-annotation>
    </parameter-proposition>
    <parameter-ref name="non-fasting-glucose-evaluation" />
  </logical-dependency-def>
</parameter-def>
<!-- Glucose monitoring -->
<!-- Temporarily, average is used for postprandial glucose
monitoring -->
- <parameter-def name="average-postprandial-glucose"
  type="mmoll" required="no">
- <calculation-def operator="divide">
    - <calculation-def operator="add">
        <parameter-ref name="after-breakfast-glucose" />
        <parameter-ref name="after-lunch-glucose" />
        <parameter-ref name="after-dinner-glucose" />
    </calculation-def>
    <numerical-constant value="3" />
  </calculation-def>
</parameter-def>
- <parameter-def name="fasting-glucose-monitoring"
  type="glucose-monitoring-scale" required="no">
- <qualitative-parameter-def use-as-context="no">
    - <limits unit="mmoll">
        - <context>

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```

        <any />
    </context>
    <limit-entry value="4" include-limit-value="yes" />
    <limit-entry value="7" include-limit-value="yes" />
    <limit-entry value="8" include-limit-value="yes" />
    <positive-infinite />
</limits>
<parameter-ref name="fasting-glucose" />
</qualitative-parameter-def>
</parameter-def>
- <parameter-def name="postprandial-glucose-monitoring"
  type="glucose-monitoring-scale" required="no">
- <qualitative-parameter-def use-as-context="no">
  - <limits>
    - <context>
      <any />
    </context>
    <negative-infinite />
    <limit-entry value="9" include-limit-value="yes" />
    <limit-entry value="10" include-limit-value="yes" />
    <positive-infinite />
  </limits>
  <!-- Temporary solution -->
  <parameter-ref name="average-postprandial-glucose" />
</qualitative-parameter-def>
</parameter-def>
- <parameter-def name="glucose-monitoring" type="glucose-
  monitoring-scale" required="no">
- <logical-dependency-def>
  <!-- one of the previous monitorings -->
  - <parameter-proposition parameter-name="fasting-glucose-
    monitoring">
    <is-known-parameter />
    - <context>
      <any />
    </context>
    - <time-annotation>
      <now />
    </time-annotation>
  </parameter-proposition>
  <parameter-ref name="fasting-glucose-monitoring" />
  - <parameter-proposition parameter-name="postprandial-
    glucose-monitoring">
    <is-known-parameter />
    - <context>
      <any />
    </context>
    - <time-annotation>
      <now />
    </time-annotation>
  </parameter-proposition>
  <parameter-ref name="postprandial-glucose-
    monitoring" />
</logical-dependency-def>
</parameter-def>
<!-- CH disease risk -->

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```

- <parameter-def name="age-in-tens" type="age-scale"
  required="no">
- <qualitative-parameter-def use-as-context="yes">
  - <limits unit="y">
    - <context>
      <any />
    </context>
    <limit-entry value="0" include-limit-value="yes" />
    <limit-entry value="40" include-limit-value="yes" />
    <limit-entry value="50" include-limit-value="yes" />
    <limit-entry value="60" include-limit-value="yes" />
    <limit-entry value="70" include-limit-value="yes" />
    <positive-infinite />
  </limits>
  <parameter-ref name="age" />
</qualitative-parameter-def>
</parameter-def>
- <parameter-def name="CH-disease-risk" type="risk-scale"
  required="no">
- <qualitative-parameter-def use-as-context="no">
  - <limits>
    - <context>
      - <context-combination operator="or">
        - <one-of name="age-in-tens">
          <value-ref name="40ies" />
        </one-of>
        - <context-combination operator="and">
          - <one-of name="age-in-tens">
            <value-ref name="50ies" />
          </one-of>
          - <one-of name="hypertension">
            <value-ref name="false" />
          </one-of>
        </context-combination>
        - <context-combination operator="and">
          - <one-of name="smoking">
            <value-ref name="false" />
          </one-of>
          - <one-of name="age-in-tens">
            <value-ref name="50ies" />
          </one-of>
          - <one-of name="hypertension">
            <value-ref name="true" />
          </one-of>
        </context-combination>
        - <context-combination operator="and">
          - <one-of name="smoking">
            <value-ref name="false" />
          </one-of>
          - <one-of name="age-in-tens">
            <value-ref name="60ies" />
          </one-of>
          - <one-of name="hypertension">
            <value-ref name="false" />
          </one-of>
        </context-combination>
      </context>
    </limits>
  </qualitative-parameter-def>
</parameter-def>

```

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- <context-combination operator="and">
  - <one-of name="sex">
    <value-ref name="female" />
  </one-of>
  - <one-of name="smoking">
    <value-ref name="false" />
  </one-of>
  - <one-of name="age-in-tens">
    <value-ref name="70ies" />
  </one-of>
  - <one-of name="hypertension">
    <value-ref name="false" />
  </one-of>
</context-combination>
</context-combination>
</context>
<negative-infinite />
<positive-infinite />
<positive-infinite />
</limits>
- <limits>
  - <context>
    - <context-combination operator="or">
      - <context-combination operator="and">
        - <one-of name="smoking">
          <value-ref name="true" />
        </one-of>
        - <one-of name="age-in-tens">
          <value-ref name="50ies" />
        </one-of>
        - <one-of name="hypertension">
          <value-ref name="true" />
        </one-of>
      </context-combination>
      - <context-combination operator="and">
        - <one-of name="sex">
          <value-ref name="female" />
        </one-of>
        - <one-of name="smoking">
          <value-ref name="false" />
        </one-of>
        - <one-of name="age-in-tens">
          <value-ref name="60ies" />
        </one-of>
        - <one-of name="hypertension">
          <value-ref name="true" />
        </one-of>
      </context-combination>
    - <context-combination operator="and">
      - <one-of name="sex">
        <value-ref name="female" />
      </one-of>
      - <one-of name="smoking">
        <value-ref name="false" />
      </one-of>
      - <one-of name="age-in-tens">

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        <value-ref name="70ies" />
      </one-of>
    - <one-of name="hypertension">
      <value-ref name="true" />
    </one-of>
  </context-combination>
</context-combination>
</context>
<limit-entry value="0" include-limit-value="yes" />
<limit-entry value="7" include-limit-value="yes" />
<positive-infinite />
</limits>
- <limits>
- <context>
  - <context-combination operator="or">
    - <context-combination operator="and">
      - <one-of name="sex">
        <value-ref name="male" />
      </one-of>
      - <one-of name="smoking">
        <value-ref name="true" />
      </one-of>
      - <one-of name="age-in-tens">
        <value-ref name="60ies" />
      </one-of>
      - <one-of name="hypertension">
        <value-ref name="false" />
      </one-of>
    </context-combination>
    - <context-combination operator="and">
      - <one-of name="sex">
        <value-ref name="female" />
      </one-of>
      - <one-of name="smoking">
        <value-ref name="true" />
      </one-of>
      - <one-of name="age-in-tens">
        <value-ref name="60ies" />
      </one-of>
      - <one-of name="hypertension">
        <value-ref name="true" />
      </one-of>
    </context-combination>
  - <context-combination operator="and">
    - <one-of name="sex">
      <value-ref name="female" />
    </one-of>
    - <one-of name="smoking">
      <value-ref name="true" />
    </one-of>
    - <one-of name="age-in-tens">
      <value-ref name="70ies" />
    </one-of>
  </context-combination>
  - <context-combination operator="and">
    - <one-of name="sex">

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        <value-ref name="male" />
      </one-of>
    - <one-of name="smoking">
        <value-ref name="false" />
      </one-of>
    - <one-of name="age-in-tens">
        <value-ref name="70ies" />
      </one-of>
    - <one-of name="hypertension">
        <value-ref name="false" />
      </one-of>
    </context-combination>
  </context-combination>
</context>
<limit-entry value="0" include-limit-value="yes" />
<limit-entry value="5" include-limit-value="yes" />
<positive-infinite />
</limits>
- <limits>
  - <context>
    - <context-combination operator="or">
      - <context-combination operator="and">
        - <one-of name="sex">
            <value-ref name="male" />
          </one-of>
        - <one-of name="smoking">
            <value-ref name="true" />
          </one-of>
        - <one-of name="age-in-tens">
            <value-ref name="60ies" />
          </one-of>
        - <one-of name="hypertension">
            <value-ref name="true" />
          </one-of>
      </context-combination>
      - <context-combination operator="and">
        - <one-of name="sex">
            <value-ref name="male" />
          </one-of>
        - <one-of name="smoking">
            <value-ref name="true" />
          </one-of>
        - <one-of name="age-in-tens">
            <value-ref name="70ies" />
          </one-of>
      </context-combination>
    </context-combination>
  </context>
  <negative-infinite />
  <negative-infinite />
  <positive-infinite />
</limits>
- <limits>
  - <context>
    - <context-combination operator="or">
      - <context-combination operator="and">

```

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- <one-of name="sex">
  <value-ref name="female" />
</one-of>
- <one-of name="smoking">
  <value-ref name="true" />
</one-of>
- <one-of name="age-in-tens">
  <value-ref name="60ies" />
</one-of>
- <one-of name="hypertension">
  <value-ref name="false" />
</one-of>
</context-combination>
- <context-combination operator="and">
  - <one-of name="sex">
    <value-ref name="male" />
  </one-of>
  - <one-of name="smoking">
    <value-ref name="false" />
  </one-of>
  - <one-of name="age-in-tens">
    <value-ref name="60ies" />
  </one-of>
  - <one-of name="hypertension">
    <value-ref name="true" />
  </one-of>
</context-combination>
- <context-combination operator="and">
  - <one-of name="sex">
    <value-ref name="male" />
  </one-of>
  - <one-of name="smoking">
    <value-ref name="false" />
  </one-of>
  - <one-of name="age-in-tens">
    <value-ref name="70ies" />
  </one-of>
  - <one-of name="hypertension">
    <value-ref name="false" />
  </one-of>
</context-combination>
</context-combination>
</context>
<limit-entry value="0" include-limit-value="yes" />
<limit-entry value="6" include-limit-value="yes" />
<positive-infinite />
</limits>
<parameter-ref name="total-cholesterol-HDL-ratio" />
</qualitative-parameter-def>
</parameter-def>
</parameter-group>
- <parameter-group title="Parameters for diagnosis and risk
  inventory">
  - <parameter-def name="thirst" type="Boolean" required="no">
    <raw-data-def mode="manual" user-text="Is the patient
      thirsty?" use-as-context="no" />

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</parameter-def>
- <parameter-def name="polyuria" type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the patient
    polyuria?" use-as-context="no" />
</parameter-def>
- <parameter-def name="weight-loss" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient lost
    weight?" use-as-context="no" />
</parameter-def>
- <parameter-def name="pruritis-vulvae" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient
    pruritis vulvae?" use-as-context="no" />
</parameter-def>
- <parameter-def name="DMT2-in-1st-grade-relatives"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the patient 1st
    grade relatives with DMT2?" use-as-context="no" />
</parameter-def>
- <parameter-def name="hypertension" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient
    hypertension?" use-as-context="no" />
</parameter-def>
- <parameter-def name="CV-diseases" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient CV
    diseases?" use-as-context="no" />
</parameter-def>
- <parameter-def name="fat-metabolism-problems" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient fat
    metabolism problems?" use-as-context="no" />
</parameter-def>
- <parameter-def name="quetelet-index" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the Quetelet
    index of the patient?" use-as-context="no" />
</parameter-def>
- <parameter-def name="ethnic-group" type="ethnic-group-scale"
  required="no">
  <raw-data-def mode="manual" user-text="What is the ethnic
    group of the patient?" use-as-context="no" />
</parameter-def>
- <parameter-def name="DMT2-in-past" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient had
    DM in the past?" use-as-context="no" />
</parameter-def>
- <parameter-def name="newborns-biggerthan-4kg"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the patient had
    newborns bigger than 4kg?" use-as-context="no" />
</parameter-def>
- <parameter-def name="CH-diseases" type="Boolean"
  required="no">

```

```

    <raw-data-def mode="manual" user-text="Has the patient CH
      diseases?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="CH-disease-in-youngerthan-64-1st-grade-
  relatives" type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Has the patient 1st
    grade relatives younger than 65 with CH diseases?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="feeding-habits" type="feeding-habits-
  scale" required="no">
  <raw-data-def mode="manual" user-text="How are the feeding
    habits of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="smoking" type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Does the patient
    smoke?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="alcohol-consuming" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Does the patient
    consume alcohol?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="physical-exercise" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Does the patient do
    any physical exercise?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="higher-blood-pressure" type="pressure"
  required="no">
  <raw-data-def mode="manual" unit="mmHg" user-text="What
    is the higher (systolic) blood pressure?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="lower-blood-pressure" type="pressure"
  required="no">
  <raw-data-def mode="manual" unit="mmHg" user-text="What
    is the lower (diastolic) blood pressure" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="albumin-in-urine" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the albumin
    value in 1st morning urine?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="albumin-creatinin-ratio-in-urine"
  type="amount" required="no">
  <raw-data-def mode="manual" user-text="What is the
    albumin/creatinin ratio in 1st morning urine?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="GHb" type="amount" required="no">
  <raw-data-def mode="manual" user-text="What is the
    glycohemoglobin value of the patient?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="total-cholesterol" type="amount"
  required="no">

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    <raw-data-def mode="manual" user-text="What is the total
      cholesterol value of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="HDL-cholesterol" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the HDL
    cholesterol value of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="triglycerids" type="amount" required="no">
  <raw-data-def mode="manual" user-text="What is the
    triglycerid level of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="creatinin" type="amount" required="no">
  <raw-data-def mode="manual" user-text="What is the creatinin
    value of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="total-cholesterol-HDL-ratio"
  type="amount" required="no">
  - <calculation-def operator="divide">
    <parameter-ref name="total-cholesterol" />
    <parameter-ref name="HDL-cholesterol" />
  </calculation-def>
  </parameter-def>
</parameter-group>
- <parameter-group title="Parameters for antidiabetic treatment">
- <parameter-def name="drug-name" type="String" required="no">
  <raw-data-def mode="manual" user-text="What is the drug you
    prescribe?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="drug-dose" type="amount" required="no">
  <raw-data-def mode="manual" user-text="What is the drug
    dose you prescribe?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="drug-dose-increase" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the increase
    you prescribe for the drug dose?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="antidiabetic-maximal-doses"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Have the maximal
    doses of antidiabetics have been attained?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="problematic-antidiabetic" type="String"
  required="no">
  <raw-data-def mode="manual" user-text="What is the
    antidiabetic causing problems?" use-as-context="no" />
  </parameter-def>
</parameter-group>
- <parameter-group title="Parameters for insulin treatment">
- <parameter-def name="par-evening-insulin-dose" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the evening
    insulin dose you prescribe? (8..12)" use-as-context="no" />
  </parameter-def>
- <parameter-def name="evening-adaptation" type="amount"

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    required="no">
    <raw-data-def mode="manual" user-text="What is the
      adaptation you prescribe for the evening insulin dose?
      (based on fasting glucose, 2..4)" use-as-context="no" />
  </parameter-def>
- <parameter-def name="par-morning-insulin-dose" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the morning
    insulin dose you prescribe? (8..12)" use-as-context="no" />
  </parameter-def>
- <parameter-def name="morning-adaptation" type="amount"
  required="no">
  <raw-data-def mode="manual" user-text="What is the
    adaptation you prescribe for the morning insulin dose?
    (based on postprandial glucose)" use-as-context="no" />
  </parameter-def>
- <parameter-def name="par-insulin-type" type="insulin-type-scale"
  required="no">
  <raw-data-def mode="manual" user-text="What is the type of
    insulin you prescribe? (mid-term, mix)" use-as-
    context="no" />
  </parameter-def>
</parameter-group>
- <parameter-group title="Parameters for treatment of related
  diseases">
- <parameter-def name="ACE-inhibitor-maximal-doses"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Have the maximal
    doses of ACE inhibitors have been attained?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="simultaneous-diseases-over"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Are the
    simultaneous diseases over?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="hypoglycemis-coma-over" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Is the hypoglycemic
    coma over?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="consultation-and-referring-over"
  type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Are the
    consultations and referrals over?" use-as-context="no" />
  </parameter-def>
</parameter-group>
- <parameter-group title="Parameters for periodical controls">
- <parameter-def name="wellbeing" type="Boolean" required="no">
  <raw-data-def mode="manual" user-text="Is the general state
    of the patient good?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="hypoglycemia" type="Boolean"
  required="no">
  <raw-data-def mode="manual" user-text="Has the patient had
    any hypoglycemia episode?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="feeding-problems" type="Boolean"

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    required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    problems with prescribed feeding?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="treatment-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    problems with prescribed treatment?" use-as-
    context="no" />
  </parameter-def>
- <parameter-def name="weight" type="mass" required="no">
    <raw-data-def mode="manual" user-text="What is the weight
    of the patient?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="feet-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    problems with feet?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="visus-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    visus problems?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="CV-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient CV
    problems?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="visus-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    visus problems?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="neuropathy" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Does the patient
    suffer from neuropathy?" use-as-context="no" />
  </parameter-def>
- <parameter-def name="sexual-problems" type="Boolean"
  required="no">
    <raw-data-def mode="manual" user-text="Has the patient
    sexual problems?" use-as-context="no" />
  </parameter-def>
</parameter-group>
<!-- Variables (they are set) for diagnosis -->
<variable-def name="typical-signs" type="Boolean"
  rounding="nearest" scalar-or-not="scalar" />
<variable-def name="risk-factors" type="Boolean" rounding="nearest"
  scalar-or-not="scalar" />
<variable-def name="glucose-determination-needed" type="Boolean"
  rounding="nearest" scalar-or-not="scalar" />
<!-- Variables (they are set) for treatment -->
<variable-def name="DMT2-treatment" type="String"
  rounding="nearest" scalar-or-not="scalar" />
<variable-def name="Hypertension-treatment" type="Boolean"
  rounding="nearest" scalar-or-not="scalar" />

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    </domain>
  </domain-defs>
- <plans>
- <plan-group>
- <plan name="Diabetes-Mellitus-Type-2">
- <intentions>
- <intention type="overall-state" verb="achieve">
- <simple-condition>
- <comparison type="not-equal">
- <left-hand-side>
  <parameter-ref name="glucose-monitoring" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="bad" />
</right-hand-side>
</comparison>
</simple-condition>
</intention>
</intentions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="yes"
  retry-aborted-subplans="no">
- <wait-for>
  <one />
</wait-for>
- <plan-activation>
  <plan-schema name="Diagnostics" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Policy" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Diagnostics">
- <intentions>
- <intention type="overall-state" verb="achieve">
- <parameter-proposition parameter-name="glucose-
  evaluation">
  <is-known-parameter />
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</intention>
</intentions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="yes"
  retry-aborted-subplans="no">
- <wait-for>
  <static-plan-pointer plan-name="Anamnesis" />
</wait-for>
- <plan-activation>

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        <plan-schema name="Anamnesis" />
      </plan-activation>
    - <plan-activation>
      <plan-schema name="Glucose-determination" />
    </plan-activation>
    - <plan-activation>
      <plan-schema name="Risk-inventory" />
    </plan-activation>
  </subplans>
</plan-body>
</plan>
- <plan name="Anamnesis">
- <intentions>
  - <intention type="overall-state" verb="achieve">
    - <simple-condition>
      <is-known-variable name="glucose-determination-
        needed" />
    </simple-condition>
  </intention>
</intentions>
- <plan-body>
  - <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
    - <subplans type="sequentially" wait-for-optional-
      subplans="yes" retry-aborted-subplans="no">
      - <wait-for>
        <static-plan-pointer plan-name="Anamnesis-typical-
          signs" />
      </wait-for>
      - <plan-activation>
        <plan-schema name="Anamnesis-typical-signs" />
      </plan-activation>
      - <plan-activation>
        <plan-schema name="Anamnesis-olderthan-45" />
      </plan-activation>
    </subplans>
  - <if-then-else>
    - <simple-condition>
      - <simple-condition-combination type="or">
        - <comparison type="equal">
          - <left-hand-side>
            <variable-ref name="typical-signs" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="true" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
          - <left-hand-side>
            <variable-ref name="risk-factors" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="true" />

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        </right-hand-side>
      </comparison>
    </simple-condition-combination>
  </simple-condition>
- <then-branch>
  - <variable-assignment variable="glucose-
    determination-needed">
    <qualitative-constant value="true" />
  </variable-assignment>
</then-branch>
- <else-branch>
  - <variable-assignment variable="glucose-
    determination-needed">
    <qualitative-constant value="false" />
  </variable-assignment>
</else-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Anamnesis-typical-signs">
- <intentions>
  - <intention type="overall-state" verb="achieve">
    - <simple-condition>
      <is-known-variable name="typical-signs" />
    </simple-condition>
  </intention>
</intentions>
- <plan-body>
  - <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
  - <subplans type="any-order" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
  - <ask>
    <parameter-ref name="thirst" />
    - <time-out>
      <now />
    </time-out>
  </ask>
  - <ask>
    <parameter-ref name="polyuria" />
    - <time-out>
      <now />
    </time-out>
  </ask>
  - <ask>
    <parameter-ref name="weight-loss" />
    - <time-out>
      <now />
    </time-out>

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```

    </ask>
  </subplans>
- <if-then-else>
- <simple-condition>
- <simple-condition-combination type="and">
  <!-- To review! -->
- <comparison type="greater-than">
- <left-hand-side>
  <variable-ref name="age" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant unit="y"
    value="60" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="sex" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="female" />
</right-hand-side>
</comparison>
</simple-condition-combination>
</simple-condition>
- <then-branch>
- <ask>
  <parameter-ref name="pruritis-vulvae" />
- <time-out>
  <now />
</time-out>
</ask>
</then-branch>
</if-then-else>
- <if-then-else>
- <simple-condition>
- <simple-condition-combination type="or">
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="thirst" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="polyuria" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="weight-loss" />

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```

        </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="true" />
      </right-hand-side>
    </comparison>
  - <simple-condition-combination type="and">
    - <comparison type="greater-than">
      - <left-hand-side>
        <variable-ref name="age" />
      </left-hand-side>
      - <right-hand-side>
        <!-- To review! -->
        <numerical-constant unit="y"
          value="60" />
      </right-hand-side>
    </comparison>
    - <comparison type="equal">
      - <left-hand-side>
        <variable-ref name="sex" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant
          value="female" />
      </right-hand-side>
    </comparison>
    <!-- ...I would have preferred is-known-
      parameter(pruritis-vulvae) here -->
    - <comparison type="equal">
      - <left-hand-side>
        <parameter-ref name="pruritis-
          vulvae" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="true" />
      </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition-combination>
</simple-condition>
- <then-branch>
  - <variable-assignment variable="typical-signs">
    <qualitative-constant value="true" />
  </variable-assignment>
</then-branch>
- <else-branch>
  - <variable-assignment variable="typical-signs">
    <qualitative-constant value="false" />
  </variable-assignment>
</else-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Anamnesis-olderthan-45">
  - <intentions>
    - <intention type="overall-state" verb="achieve">

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```

- <simple-condition>
  <is-known-variable name="risk-factors" />
</simple-condition>
</intention>
</intentions>
- <conditions>
- <filter-precondition>
- <constraint-combination type="and">
- <simple-condition>
- <comparison type="greater-than">
- <left-hand-side>
  <variable-ref name="age" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant unit="y" value="45" />
</right-hand-side>
</comparison>
</simple-condition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="triennial-visit" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
</simple-condition>
</constraint-combination>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="DMT2-in-1sr-grade-
    relatives" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="hypertension" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>

```

```

    <parameter-ref name="CV-diseases" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="fat-metabolism-
    problems" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="quetelet-index" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="ethnic-group" />
  - <time-out>
    <now />
  </time-out>
</ask>
</subplans>
- <if-then-else>
  - <simple-condition>
    - <comparison type="equal">
      - <left-hand-side>
        <variable-ref name="sex" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="female" />
      </right-hand-side>
    </comparison>
  </simple-condition>
  - <then-branch>
    - <ask>
      <parameter-ref name="DM-in-past" />
      - <time-out>
        <now />
      </time-out>
    </ask>
    - <ask>
      <parameter-ref name="newborns-biggerthan-
        4kg" />
      - <time-out>
        <now />
      </time-out>
    </ask>
  </then-branch>
</if-then-else>
- <if-then-else>
  - <simple-condition>
    - <simple-condition-combination type="or">
      - <comparison type="equal">

```

```

- <left-hand-side>
  <parameter-ref name="DMT2-in-1st-
    grade-relatives" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="hypertension" />
  </left-hand-side>
  - <right-hand-side>
    <qualitative-constant value="true" />
  </right-hand-side>
</comparison>
- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="CV-diseases" />
  </left-hand-side>
  - <right-hand-side>
    <qualitative-constant value="true" />
  </right-hand-side>
</comparison>
- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="fat-metabolism-
      problems" />
  </left-hand-side>
  - <right-hand-side>
    <qualitative-constant value="true" />
  </right-hand-side>
</comparison>
- <comparison type="greater-or-equal">
  <!-- To review! -->
  - <left-hand-side>
    <parameter-ref name="quetelet-
      index" />
  </left-hand-side>
  - <right-hand-side>
    <numerical-constant unit="amount"
      value="27" />
  </right-hand-side>
</comparison>
- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="ethnic-group" />
  </left-hand-side>
  - <right-hand-side>
    <qualitative-constant
      value="hindustanian" />
  </right-hand-side>
</comparison>
- <simple-condition-combination type="and">
  - <comparison type="equal">
    - <left-hand-side>

```

```

        <variable-ref name="sex" />
      </left-hand-side>
    - <right-hand-side>
      <qualitative-constant
        value="female" />
      </right-hand-side>
    </comparison>
    <!-- ...though I would prefer is-known-
parameter(...) instead -->
  - <simple-condition-combination type="or">
  - <comparison type="equal">
    - <left-hand-side>
      <parameter-ref name="DM-in-
past" />
      </left-hand-side>
    - <right-hand-side>
      <qualitative-constant
        value="true" />
      </right-hand-side>
    </comparison>
  - <comparison type="equal">
    - <left-hand-side>
      <parameter-ref name="newborns-
biggerthan-4kg" />
      </left-hand-side>
    - <right-hand-side>
      <qualitative-constant
        value="true" />
      </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition-combination>
</simple-condition-combination>
</simple-condition>
- <then-branch>
  - <variable-assignment variable="risk-factors">
    <qualitative-constant value="true" />
    </variable-assignment>
  </then-branch>
- <else-branch>
  - <variable-assignment variable="risk-factors">
    <qualitative-constant value="false" />
    </variable-assignment>
  </else-branch>
</if-then-else>
</subplans>
</plan-body>
</plan>
- <plan name="Glucose-determination">
- <intentions>
  - <intention type="overall-state" verb="achieve">
    - <constraint-combination type="or">
      - <parameter-proposition parameter-name="fasting-
glucose">
        <is-known-parameter />
      - <context>

```

```

        <any />
      </context>
    - <time-annotation>
      <now />
    </time-annotation>
  </parameter-proposition>
- <parameter-proposition parameter-name="postprandial-
  glucose">
  <is-known-parameter />
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
</constraint-combination>
</intention>
</intentions>
- <conditions>
- <filter-precondition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="glucose-determination-
  needed" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
</simple-condition>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <one />
</wait-for>
- <plan-activation>
  <plan-schema name="Fasting-glucose-test-
  manual" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Non-fasting-glucose-test-
  manual" />
</plan-activation>
</subplans>
- <if-then-else>
- <simple-condition>

```

```

- <comparison type="equal">
  - <left-hand-side>
    <parameter-ref name="glucose-
      evaluation" />
  </left-hand-side>
  - <right-hand-side>
    <qualitative-constant value="DMT2" />
  </right-hand-side>
</comparison>
</simple-condition>
- <then-branch>
  - <plan-activation>
    - <plan-schema name="Fasting-glucose-test">
      - <time-annotation>
        - <time-range>
          - <starting-shift include-limit-
            value="yes">
            - <earliest>
              <numerical-constant
                scale="time" unit="d"
                value="2" />
            </earliest>
            - <latest>
              <numerical-constant
                scale="time" unit="d"
                value="7" />
            </latest>
          </starting-shift>
        </time-range>
      - <references>
        - <plan-state-transition
          direction="leave" instance-
            type="first" state="completed"
            instance-number="1">
          - <plan-pointer instance-type="first"
            instance-number="1">
            <static-plan-pointer plan-
              name="Fasting-glucose-
                test-manual" />
            </plan-pointer>
          </plan-state-transition>
          - <plan-state-transition
            direction="leave" instance-
              type="first" state="completed"
              instance-number="1">
            - <plan-pointer instance-type="first"
              instance-number="1">
              <static-plan-pointer plan-
                name="Non-fasting-
                  glucose-test-manual" />
              </plan-pointer>
            </plan-state-transition>
          </references>
        </time-annotation>
      </plan-schema>
    </plan-activation>
  </then-branch>

```

```

        </if-then-else>
    </subplans>
</plan-body>
</plan>
- <plan name="Fasting-glucose-test-manual" title="Fasting glucose
  test">
  - <conditions>
    <activate-mode started="manual" />
  </conditions>
  - <plan-body>
    - <subplans type="any-order" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <all />
      </wait-for>
      - <ask>
        <parameter-ref name="glucose-measurement-type" />
        - <time-out>
          <now />
        </time-out>
      </ask>
      - <ask>
        <parameter-ref name="fasting-glucose" />
        - <time-out>
          <now />
        </time-out>
      </ask>
    </subplans>
  </plan-body>
</plan>
- <plan name="Non-fasting-glucose-test-manual" title="Non-fasting
  glucose test">
  - <conditions>
    <activate-mode started="manual" />
  </conditions>
  - <plan-body>
    - <subplans type="any-order" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <all />
      </wait-for>
      - <ask>
        <parameter-ref name="glucose-measurement-type" />
        - <time-out>
          <now />
        </time-out>
      </ask>
      - <ask>
        <parameter-ref name="non-fasting-glucose" />
        - <time-out>
          <now />
        </time-out>
      </ask>
    </subplans>
  </plan-body>
</plan>

```

```

- <plan name="Fasting-glucose-test" title="Fasting glucose test">
- <plan-body>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="glucose-measurement-type" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="fasting-glucose" />
- <time-out>
  <now />
</time-out>
</ask>
</subplans>
</plan-body>
</plan>
- <plan name="Risk-inventory">
- <conditions>
- <filter-precondition>
- <constraint-combination type="and">
- <parameter-proposition parameter-name="glucose-
  evaluation">
  <is-known-parameter />
- <context>
  <any />
</context>
- <time-annotation>
  <now />
</time-annotation>
</parameter-proposition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="glucose-evaluation" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="DMT2" />
</right-hand-side>
</comparison>
</simple-condition>
</constraint-combination>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>

```

```

    <parameter-ref name="CH-diseases" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="CH-disease-in-youngerthan-60-
    1st-grade-relatives" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="feeding-habits" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="smoking" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="alcohol-consuming" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="physical-exercise" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="quetelet-index" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="higher-blood-pressure" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="lower-blood-pressure" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <if-then-else>
  - <simple-condition>

```

```

- <comparison type="less-than">
  - <left-hand-side>
    <variable-ref name="age" />
  </left-hand-side>
  - <right-hand-side>
    <numerical-constant unit="y" value="50" />
  </right-hand-side>
</comparison>
</simple-condition>
- <then-branch>
  - <plan-activation>
    <plan-schema name="Albumin-test" />
  </plan-activation>
</then-branch>
</if-then-else>
- <ask>
  <parameter-ref name="GHb" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="creatinin" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <plan-activation>
  <plan-schema name="Cholesterol-tests" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Feet-investigation" />
</plan-activation>
- <plan-activation>
  - <plan-schema name="Retinopathy-investigation">
    <!-- Within 6 months. -->
    - <time-annotation>
      - <time-range>
        - <finishing-shift include-limit-value="yes">
          - <latest>
            <numerical-constant scale="time"
              unit="mon" value="6" />
          </latest>
        </finishing-shift>
      </time-range>
      <self />
    </time-annotation>
  </plan-schema>
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Albumin-test">
  - <plan-body>
    - <subplans type="any-order" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">

```

```

- <wait-for>
  <one />
</wait-for>
- <plan-activation>
  <plan-schema name="Albumin-test-manual" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Albumin-creatinin-ratio-test-
    manual" />
  </plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Albumin-test-manual">
- <conditions>
  <activate-mode started="manual" />
</conditions>
- <plan-body>
- <ask>
  <parameter-ref name="albumin-in-urine" />
  - <time-out>
    <now />
  </time-out>
</ask>
</plan-body>
</plan>
- <plan name="Albumin-creatinin-ratio-test-manual">
- <conditions>
  <activate-mode started="manual" />
</conditions>
- <plan-body>
- <ask>
  <parameter-ref name="albumin-creatinin-ratio-in-urine" />
  - <time-out>
    <now />
  </time-out>
</ask>
</plan-body>
</plan>
- <plan name="Cholesterol-tests">
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="total-cholesterol" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="HDL-cholesterol" />
  - <time-out>
    <now />

```

```

        </time-out>
      </ask>
    - <ask>
      <parameter-ref name="triglycerids" />
    - <time-out>
      <now />
    </time-out>
  </ask>
</subplans>
</plan-body>
</plan>
- <plan name="Feet-investigation" title="Perform a feet
  investigation">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Retinopathy-investigation" title="Perform a
  retinopathy investigation">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Policy">
  - <intentions>
    - <intention label="avoid-bad-glucose-values"
      type="intermediate-state" verb="avoid">
    - <simple-condition>
      - <comparison type="equal">
        - <left-hand-side>
          <parameter-ref name="glucose-monitoring" />
        </left-hand-side>
        - <right-hand-side>
          <qualitative-constant value="bad" />
        </right-hand-side>
      </comparison>
    </simple-condition>
    </intention>
  </intentions>
  - <conditions>
    - <filter-precondition>
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <variable-ref name="glucose-evaluation" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="DMT2" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </filter-precondition>
  </conditions>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">

```

```

- <wait-for>
  <all />
</wait-for>
- <plan-activation>
  <plan-schema name="Education-DMT2" />
</plan-activation>
- <subplans retry-aborted-subplans="yes" type="unordered"
  wait-for-optional-subplans="no">
- <wait-for>
  <static-plan-pointer plan-name="Treatments-and-
    Controls" />
</wait-for>
- <plan-activation>
  <plan-schema name="Treatments-and-Controls" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Policy-for-simultaneous-
    diseases" />
</plan-activation>
- <plan-activation>
  <plan-schema name="Policy-for-hypoglycemic-
    coma" />
</plan-activation>
  <!-- There will be a plan-activation Consultation-
    and-referring here -->
</subplans>
</subplans>
</plan-body>
</plan>
- <plan name="Education-DMT2" title="Give information about the
  most important aspects of DM">
- <plan-body>
  <user-performed />
</plan-body>
</plan>
- <plan name="Treatments-and-Controls">
- <conditions>
- <complete-condition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="alive" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="false" />
</right-hand-side>
</comparison>
</simple-condition>
</complete-condition>
</conditions>
- <plan-body>
- <subplans type="parallel" wait-for-optional-subplans="no" retry-
  aborted-subplans="no">
- <wait-for>
  <none />
</wait-for>

```

```

- <plan-activation>
  <plan-schema name="Non-insulin-DMT2-
    treatments" />
- <on-abort>
  - <plan-activation>
    <plan-schema name="Insulin-DMT2-
      treatments" />
    </plan-activation>
  </on-abort>
</plan-activation>
- <plan-activation>
  <plan-schema name="Treatment-of-CV-disease-risk-
    factors" />
</plan-activation>
- <cyclical-plan>
  - <cyclical-plan-body>
    - <plan-activation>
      <plan-schema name="Quarterly-control" />
    </plan-activation>
  </cyclical-plan-body>
- <repeat-specification>
  - <retry-delay include-limit-value="yes">
    - <minimum>
      <numerical-constant scale="time" unit="mon"
        value="2.5" />
    </minimum>
    - <maximum>
      <numerical-constant scale="time" unit="mon"
        value="3.5" />
    </maximum>
  </retry-delay>
</repeat-specification>
</cyclical-plan>
- <cyclical-plan>
  - <cyclical-plan-body>
    - <plan-activation>
      <plan-schema name="Annual-control" />
    </plan-activation>
  </cyclical-plan-body>
- <repeat-specification>
  - <retry-delay include-limit-value="yes">
    - <minimum>
      <numerical-constant scale="time" unit="mon"
        value="11.5" />
    </minimum>
    - <maximum>
      <numerical-constant scale="time" unit="mon"
        value="12.5" />
    </maximum>
  </retry-delay>
</repeat-specification>
</cyclical-plan>
</subplans>
</plan-body>
</plan>
<!-- DMT2 treatments -->

```

```

<!-- Non-insulin treatments -->
- <plan name="Non-insulin-DMT2-treatments">
  - <intentions>
    <refer-to label="avoid-bad-glucose-values" plan-
      name="Policy" />
  </intentions>
  - <conditions>
    - <abort-condition>
      - <constraint-combination type="and">
        - <simple-condition>
          - <comparison type="equal">
            - <left-hand-side>
              <parameter-ref name="glucose-
                monitoring" />
            </left-hand-side>
            - <right-hand-side>
              <qualitative-constant value="bad" />
            </right-hand-side>
          </comparison>
        </simple-condition>
        - <plan-state-constraint state="completed">
          - <plan-pointer instance-type="first" instance-
            number="1">
            <static-plan-pointer plan-name="SU-derivative-
              plus-metformin-treatment" />
          </plan-pointer>
          - <time-annotation>
            <now />
          </time-annotation>
        </plan-state-constraint>
      </constraint-combination>
    </abort-condition>
  </conditions>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="yes"
      retry-aborted-subplans="no">
      - <wait-for>
        <static-plan-pointer plan-name="Diet-specialist-
          referring" />
      </wait-for>
      - <plan-activation>
        <plan-schema name="Diet-specialist-referring" />
      </plan-activation>
      - <plan-activation>
        - <plan-schema name="Fasting-glucose-test">
          <!-- To review! 'after 3 months', understood in
            a flexible manner -->
          - <time-annotation>
            - <time-range>
              - <starting-shift include-limit-value="yes">
                - <earliest>
                  <numerical-constant scale="time"
                    unit="w" value="11" />
                </earliest>
                - <latest>
                  <numerical-constant scale="time"

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        unit="w" value="13" />
      </latest>
    </starting-shift>
  </time-range>
  - <plan-state-transition direction="leave" instance-
    type="first" state="activated" instance-
    number="1">
    - <plan-pointer instance-type="first" instance-
      number="1">
      <static-plan-pointer plan-name="Diet-
        specialist-referring" />
    </plan-pointer>
  </plan-state-transition>
</time-annotation>
</plan-schema>
</plan-activation>
- <plan-activation>
  <plan-schema name="SU-derivative-treatment" />
</plan-activation>
- <plan-activation>
  <plan-schema name="SU-derivative-plus-metformin-
    treatment" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Diet-specialist-referring" title="Diet specialist
  referring">
  - <intentions>
    <refer-to label="avoid-bad-glucose-values" plan-
      name="Policy" />
  </intentions>
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="SU-derivative-treatment">
  - <value-defs>
    <variable-def name="antidiabetics" scalar-or-not="list"
      type="String" rounding="nearest" />
    <variable-def name="antidiabetic-doses" scalar-or-not="list"
      type="amount" rounding="nearest" />
  - <iterator-def name="iterator-antidiabetics" start-at="first-
    element">
    <variable-ref name="antidiabetics" />
  </iterator-def>
  - <iterator-def name="iterator-antidiabetic-doses" start-
    at="first-element">
    <variable-ref name="antidiabetic-doses" />
  </iterator-def>
</value-defs>
  - <intentions>
    <refer-to label="avoid-bad-glucose-values" plan-
      name="Policy" />
  </intentions>
  - <conditions>
    - <filter-precondition>

```

```

- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="glucose-monitoring" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="bad" />
</right-hand-side>
</comparison>
</simple-condition>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <if-then-else>
- <simple-condition>
- <comparison type="less-or-equal">
- <left-hand-side>
  <parameter-ref name="quetelet-index" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant scale="amount"
    value="27" />
</right-hand-side>
</comparison>
</simple-condition>
- <then-branch>
- <ask>
  <parameter-ref name="drug-name" />
- <time-out>
  <now />
</time-out>
</ask>
- <put-last list="antidiabetics">
- <element>
  <parameter-ref name="drug-name" />
</element>
</put-last>
</then-branch>
- <else-branch>
- <put-last list="antidiabetics">
- <element>
  <string-constant value="metformin" />
</element>
</put-last>
</else-branch>
</if-then-else>
- <plan-activation>
- <plan-schema name="Initialise-drug-doses">
- <argument-value name="drugs">
  <variable-ref name="antidiabetics" />
</argument-value>

```

```

- <argument-value name="iterator-drugs">
  <variable-ref name="iterator-antidiabetics" />
</argument-value>
- <argument-value name="drug-doses">
  <variable-ref name="antidiabetic-doses" />
</argument-value>
- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-antidiabetic-
    doses" />
</argument-value>
<return-value-assignment return-value-name="out-
  drug-doses" variable-name="antidiabetic-
  doses" />
</plan-schema>
</plan-activation>
- <plan-activation>
- <plan-schema name="Find-drug-doses">
- <argument-value name="drugs">
  <variable-ref name="antidiabetics" />
</argument-value>
- <argument-value name="iterator-drugs">
  <variable-ref name="iterator-antidiabetics" />
</argument-value>
- <argument-value name="drug-doses">
  <variable-ref name="antidiabetic-doses" />
</argument-value>
- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-antidiabetic-
    doses" />
</argument-value>
<return-value-assignment return-value-name="out-
  drug-doses" variable-name="antidiabetic-
  doses" />
</plan-schema>
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Initialise-drug-doses">
- <arguments>
  <argument name="drugs" scalar-or-not="list" type="String" />
  <argument name="iterator-drugs" type="iterator" scalar-or-
    not="scalar" />
  <argument name="drug-doses" scalar-or-not="list"
    type="amount" />
  <argument name="iterator-drug-doses" type="iterator" scalar-
    or-not="scalar" />
</arguments>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
<reset-iterator iterator="iterator-drugs" />
<reset-iterator iterator="iterator-drug-doses" />
<go-to-next iterator="iterator-drug-doses" />

```

```

- <iterative-plan>
- <do-repeatedly>
  <!-- A Display would be needed HERE!!! -->
- <ask>
  <parameter-ref name="drug-dose" />
- <time-out>
  <now />
</time-out>
</ask>
- <insert-before-iterator iterator="iterator-drug-
doses">
- <element>
  <parameter-ref name="drug-dose" />
</element>
</insert-before-iterator>
<go-to-next iterator="iterator-drugs" />
<go-to-next iterator="iterator-drug-doses" />
</do-repeatedly>
- <termination-condition>
  <is-at-end iterator="iterator-drugs" />
</termination-condition>
</iterative-plan>
</subplans>
</plan-body>
- <returns>
- <return-value name="out-drug-doses">
  <variable-ref name="drug-doses" />
</return-value>
</returns>
</plan>
- <plan name="Find-drug-doses">
- <arguments>
  <argument name="drugs" scalar-or-not="list" type="String" />
  <argument name="iterator-drugs" type="iterator" scalar-or-
not="scalar" />
  <argument name="drug-doses" scalar-or-not="list"
type="amount" />
  <argument name="iterator-drug-doses" type="iterator" scalar-
or-not="scalar" />
</arguments>
- <conditions>
- <suspend-condition>
- <constraint-combination type="and">
  <refer-to label="antidiabetic-problems" plan-
name="Check-for-antidiabetic-problems" />
- <plan-state-constraint state="activated">
- <plan-pointer instance-type="first" instance-
number="1">
  <static-plan-pointer plan-name="Check-for-
antidiabetic-problems" />
</plan-pointer>
- <time-annotation>
  <now />
</time-annotation>
</plan-state-constraint>
</constraint-combination>

```

```

    </suspend-condition>
  - <reactivate-condition>
    - <plan-state-constraint state="completed">
      - <plan-pointer instance-type="first" instance-number="1">
        <static-plan-pointer plan-name="Check-for-
          antidiabetic-problems" />
      </plan-pointer>
      - <time-annotation>
        <now />
      </time-annotation>
    </plan-state-constraint>
  </reactivate-condition>
  - <complete-condition>
    - <simple-condition>
      - <comparison type="not-equal">
        - <left-hand-side>
          <parameter-ref name="glucose-monitoring" />
        </left-hand-side>
        - <right-hand-side>
          <qualitative-constant value="bad" />
        </right-hand-side>
      </comparison>
    </simple-condition>
  </complete-condition>
  - <abort-condition>
    - <simple-condition>
      - <simple-condition-combination type="and">
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="antidiabetic-
              maximal-doses" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="true" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="glucose-
              monitoring" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="bad" />
          </right-hand-side>
        </comparison>
      </simple-condition-combination>
    </simple-condition>
  </abort-condition>
</conditions>
- <plan-body>
  - <cyclical-plan>
    - <cyclical-plan-body>
      - <plan-activation>
        - <plan-schema name="Increase-drug-doses">
          - <argument-value name="drugs">
            <variable-ref name="drugs" />

```

```

        </argument-value>
      - <argument-value name="iterator-drugs">
        <variable-ref name="iterator-drugs" />
      </argument-value>
      - <argument-value name="drug-doses">
        <variable-ref name="drug-doses" />
      </argument-value>
      - <argument-value name="iterator-drug-doses">
        <variable-ref name="iterator-drug-doses" />
      </argument-value>
      <return-value-assignment return-value-
        name="out-drug-doses" variable-name="drug-
        doses" />
    </plan-schema>
  </plan-activation>
</cyclical-plan-body>
- <repeat-specification>
  - <retry-delay include-limit-value="yes">
    - <minimum>
      <numerical-constant scale="time" unit="w"
        value="2" />
    </minimum>
    - <maximum>
      <numerical-constant scale="time" unit="w"
        value="4" />
    </maximum>
  </retry-delay>
</repeat-specification>
</cyclical-plan>
</plan-body>
- <returns>
  - <return-value name="out-drug-doses">
    <variable-ref name="drug-doses" />
  </return-value>
</returns>
</plan>
- <plan name="Increase-drug-doses">
  - <arguments>
    <argument name="drugs" scalar-or-not="list" type="String" />
    <argument name="iterator-drugs" type="iterator" scalar-or-
      not="scalar" />
    <argument name="drug-doses" scalar-or-not="list"
      type="amount" />
    <argument name="iterator-drug-doses" type="iterator" scalar-
      or-not="scalar" />
  </arguments>
  - <value-defs>
    <variable-def name="aux-doses" scalar-or-not="list"
      type="amount" rounding="nearest" />
  </value-defs>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <all />
      </wait-for>
    </subplans>
  </plan-body>
</plan>

```

```

- <ask>
  <parameter-ref name="antidiabetic-maximal-doses" />
- <time-out>
  <now />
</time-out>
</ask>
<reset-iterator iterator="iterator-drugs" />
<reset-iterator iterator="iterator-drug-doses" />
- <iterative-plan>
- <do-repeatedly>
  <!-- A Display would be needed HERE!!! (to
    display the name of the drug being increased) -->
- <ask>
  <parameter-ref name="drug-dose-increase" />
- <time-out>
  <now />
</time-out>
</ask>
- <put-last list="aux-doses">
- <element>
  - <operation operator="add">
    <parameter-ref name="drug-dose-
      increase" />
    <get iterator="iterator-drug-doses" />
  </operation>
</element>
</put-last>
<go-to-next iterator="iterator-drugs" />
<go-to-next iterator="iterator-drug-doses" />
</do-repeatedly>
- <termination-condition>
  <is-at-end iterator="iterator-drugs" />
</termination-condition>
</iterative-plan>
</subplans>
</plan-body>
- <returns>
- <return-value name="out-drug-doses">
  <variable-ref name="aux-doses" />
</return-value>
</returns>
</plan>
- <plan name="SU-derivative-plus-metformin-treatment">
- <value-defs>
  <variable-def name="antidiabetics" scalar-or-not="list"
    type="String" rounding="nearest" />
  <variable-def name="antidiabetic-doses" scalar-or-not="list"
    type="amount" rounding="nearest" />
- <iterator-def name="iterator-antidiabetics" start-at="first-
  element">
  <variable-ref name="antidiabetics" />
</iterator-def>
- <iterator-def name="iterator-antidiabetic-doses" start-
  at="first-element">
  <variable-ref name="antidiabetic-doses" />
</iterator-def>

```

```

</value-defs>
- <intentions>
  - <intention type="intermediate-state" verb="avoid">
    <refer-to label="antidiabetic-problems" plan-name="Check-
      for-antidiabetic-problems" />
    </intention>
    <refer-to label="avoid-bad-glucose-values" plan-
      name="Policy" />
  </intentions>
- <conditions>
  - <filter-precondition>
    - <simple-condition>
      - <comparison type="equal">
        - <left-hand-side>
          <parameter-ref name="glucose-monitoring" />
        </left-hand-side>
        - <right-hand-side>
          <qualitative-constant value="bad" />
        </right-hand-side>
      </comparison>
    </simple-condition>
  </filter-precondition>
</conditions>
- <plan-body>
  - <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
    - <ask>
      <parameter-ref name="drug-name" />
      - <time-out>
        <now />
      </time-out>
    </ask>
    - <put-last list="antidiabetics">
      - <element>
        <parameter-ref name="drug-name" />
      </element>
    </put-last>
    - <put-last list="antidiabetics">
      - <element>
        <string-constant value="metformin" />
      </element>
    </put-last>
    - <plan-activation>
      - <plan-schema name="Initialise-drug-doses">
        - <argument-value name="drugs">
          <variable-ref name="antidiabetics" />
        </argument-value>
        - <argument-value name="iterator-drugs">
          <variable-ref name="iterator-antidiabetics" />
        </argument-value>
        - <argument-value name="drug-doses">
          <variable-ref name="antidiabetic-doses" />
        </argument-value>

```

```

- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-antidiabetic-
    doses" />
</argument-value>
<return-value-assignment return-value-name="out-
  drug-doses" variable-name="antidiabetic-
    doses" />
</plan-schema>
</plan-activation>
- <subplans type="unordered" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <static-plan-pointer plan-name="Find-drug-doses" />
</wait-for>
<!-- Tthe periodicity of drug increases is the
same -->
- <plan-activation>
- <plan-schema name="Find-drug-doses">
- <argument-value name="drugs">
  <variable-ref name="antidiabetics" />
</argument-value>
- <argument-value name="iterator-drugs">
  <variable-ref name="iterator-
    antidiabetics" />
</argument-value>
- <argument-value name="drug-doses">
  <variable-ref name="antidiabetic-doses" />
</argument-value>
- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-antidiabetic-
    doses" />
</argument-value>
<return-value-assignment return-value-
  name="out-drug-doses" variable-
  name="antidiabetic-doses" />
</plan-schema>
</plan-activation>
- <plan-activation>
- <plan-schema name="Check-for-antidiabetic-
  problems">
- <argument-value name="drugs">
  <variable-ref name="antidiabetics" />
</argument-value>
- <argument-value name="iterator-drugs">
  <variable-ref name="iterator-
    antidiabetics" />
</argument-value>
- <argument-value name="drug-doses">
  <variable-ref name="antidiabetic-doses" />
</argument-value>
- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-antidiabetic-
    doses" />
</argument-value>
<return-value-assignment return-value-
  name="out-drugs" variable-
  name="antidiabetics" />

```

```

        <return-value-assignment return-value-
            name="out-drug-doses" variable-
            name="antidiabetic-doses" />
    </plan-schema>
</plan-activation>
</subplans>
</subplans>
</plan-body>
</plan>
- <plan name="Check-for-antidiabetic-problems">
- <arguments>
    <argument name="drugs" scalar-or-not="list" type="String" />
    <argument name="iterator-drugs" type="iterator" scalar-or-
        not="scalar" />
    <argument name="drug-doses" scalar-or-not="list"
        type="amount" />
    <argument name="iterator-drug-doses" type="iterator" scalar-
        or-not="scalar" />
</arguments>
- <conditions>
- <filter-precondition>
    - <simple-condition label="antidiabetic-problems">
        - <simple-condition-combination type="or">
            - <comparison type="equal">
                - <left-hand-side>
                    <variable-ref name="contraindications" />
                </left-hand-side>
                - <right-hand-side>
                    <qualitative-constant value="true" />
                </right-hand-side>
            </comparison>
            - <comparison type="equal">
                - <left-hand-side>
                    <variable-ref name="side-effects" />
                </left-hand-side>
                - <right-hand-side>
                    <qualitative-constant value="true" />
                </right-hand-side>
            </comparison>
        </simple-condition-combination>
    </simple-condition>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
        <all />
    </wait-for>
    - <ask>
        <parameter-ref name="problematic-antidiabetic" />
    - <time-out>
        <now />
    </time-out>
    </ask>
    <reset-iterator iterator="iterator-drugs" />

```

```

    <reset-iterator iterator="iterator-drug-doses" />
  - <iterative-plan>
    - <do-repeatedly>
      <go-to-next iterator="iterator-drugs" />
      <go-to-next iterator="iterator-drug-doses" />
    </do-repeatedly>
    - <termination-condition>
      - <simple-condition-combination type="or">
        - <comparison type="equal">
          - <left-hand-side>
            <get iterator="iterator-drugs" />
          </left-hand-side>
          - <right-hand-side>
            <parameter-ref name="problematic-antidiabetic" />
          </right-hand-side>
        </comparison>
        <is-at-end iterator="iterator-drugs" />
      </simple-condition-combination>
    </termination-condition>
  </iterative-plan>
  <remove-at-iterator iterator="iterator-drugs" />
  <remove-at-iterator iterator="iterator-drug-doses" />
- <put-last list="drugs">
  - <element>
    <string-constant value="acarbose" />
  </element>
</put-last>
<!-- A Display would be needed HERE!!! (to display that
the problematic drug is being replaced with acarbose) -->
- <ask>
  <parameter-ref name="drug-dose" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <put-last list="drug-doses">
  - <element>
    <parameter-ref name="drug-dose" />
  </element>
</put-last>
</subplans>
</plan-body>
- <returns>
  - <return-value name="out-drugs">
    <variable-ref name="drugs" />
  </return-value>
  - <return-value name="out-drug-doses">
    <variable-ref name="drug-doses" />
  </return-value>
</returns>
</plan>
<!-- Insulin treatments -->
- <plan name="Insulin-DMT2-treatments">
  - <intentions>
    <refer-to label="avoid-bad-glucose-values" plan-

```

```

        name="Policy" />
    </intentions>
    - <conditions>
        - <filter-precondition>
            - <simple-condition>
                - <comparison type="equal">
                    - <left-hand-side>
                        <parameter-ref name="glucose-monitoring" />
                    </left-hand-side>
                    - <right-hand-side>
                        <qualitative-constant value="bad" />
                    </right-hand-side>
                </comparison>
            </simple-condition>
        </filter-precondition>
    </conditions>
    - <plan-body>
        - <subplans type="sequentially" wait-for-optional-subplans="no"
            retry-aborted-subplans="no">
            - <wait-for>
                <all />
            </wait-for>
            - <plan-activation>
                <plan-schema name="Education-insulin" />
            </plan-activation>
            - <subplans type="any-order" wait-for-optional-subplans="no"
                retry-aborted-subplans="no">
                - <wait-for>
                    <one />
                </wait-for>
                - <plan-activation>
                    <plan-schema name="Insulin-plus-antidiabetics-
                        treatment" />
                </plan-activation>
                - <plan-activation>
                    <plan-schema name="Only-insulin-treatment" />
                </plan-activation>
            </subplans>
        </subplans>
    </plan-body>
</plan>
- <plan name="Education-insulin" title="Give information about insulin
    self-control">
    - <plan-body>
        <user-performed />
    </plan-body>
</plan>
- <plan name="Insulin-plus-antidiabetics-treatment">
    - <value-defs>
        <variable-def name="insulin-dd" type="amount"
            rounding="nearest" scalar-or-not="scalar" />
        <variable-def name="insulin-type" type="insulin-type"
            rounding="nearest" scalar-or-not="scalar" />
        <variable-def name="evening-insulin-dose" type="amount"
            rounding="nearest" scalar-or-not="scalar" />
        <variable-def name="evening-insulin-intake" type="insulin-

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    intake-scale rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="morning-insulin-dose" type="amount"
      rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="morning-insulin-intake" type="insulin-
      intake-scale" rounding="nearest" scalar-or-not="scalar" />
  </value-defs>
- <intentions>
  <refer-to label="avoid-bad-glucose-values" plan-
    name="Policy" />
</intentions>
- <conditions>
  <activate-mode started="manual" />
</conditions>
- <plan-body>
  - <subplans type="sequentially" wait-for-optional-subplans="yes"
    retry-aborted-subplans="no">
    - <wait-for>
      <static-plan-pointer plan-name="Four-points-day-
        curve" />
    </wait-for>
    - <variable-assignment variable="DMT2-treatment">
      <string-constant value="insulin+antidiabetics" />
    </variable-assignment>
    <!-- Previous oral drugs are kept. -->
    - <plan-activation>
      <plan-schema name="Four-points-day-curve" />
    </plan-activation>
    - <variable-assignment variable="insulin-type">
      <qualitative-constant value="mid-term" />
    </variable-assignment>
    - <variable-assignment variable="insulin-dd">
      <numerical-constant value="1" />
    </variable-assignment>
    - <ask>
      <parameter-ref name="par-evening-insulin-dose" />
      - <time-out>
        <now />
      </time-out>
    </ask>
    - <variable-assignment variable="evening-insulin-dose">
      <parameter-ref name="par-evening-insulin-dose" />
    </variable-assignment>
    - <variable-assignment variable="evening-insulin-intake">
      <qualitative-constant value="after-meal" />
    </variable-assignment>
    <!-- Check after 2-3 days (this is done in Find-
      evening-insulin-dose). -->
    - <plan-activation>
      - <plan-schema name="Find-evening-insulin-dose">
        - <time-annotation>
          - <time-range>
            - <starting-shift include-limit-value="yes">
              - <earliest>
                <numerical-constant scale="time"
                  unit="d" value="2" />
              </earliest>

```

```

- <latest>
  <numerical-constant scale="time"
    unit="d" value="3" />
  </latest>
</starting-shift>
</time-range>
<self />
</time-annotation>
</plan-schema>
</plan-activation>
- <plan-activation>
- <plan-schema name="Change-insulin-to-2dd">
- <argument-value name="evening-dose">
  <variable-ref name="evening-insulin-dose" />
</argument-value>
<return-value-assignment return-value-name="out-
dd" variable-name="insulin-dd" />
<return-value-assignment return-value-name="out-
evening-intake" variable-name="evening-insulin-
intake" />
<return-value-assignment return-value-name="out-
morning-dose" variable-name="morning-insulin-
dose" />
<return-value-assignment return-value-name="out-
morning-intake" variable-name="morning-
insulin-intake" />
</plan-schema>
</plan-activation>
<!-- There will be a plan Check-for-insufficient-
correction here. -->
</subplans>
</plan-body>
</plan>
- <plan name="Four-points-day-curve">
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="fasting-glucose" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="after-breakfast-glucose" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="after-lunch-glucose" />
- <time-out>
  <now />

```

```

        </time-out>
      </ask>
    - <ask>
      <parameter-ref name="after-dinner-glucose" />
      - <time-out>
        <now />
      </time-out>
    </ask>
  </subplans>
</plan-body>
</plan>
- <plan name="Find-evening-insulin-dose">
  - <arguments>
    <argument name="evening-dose" type="amount" scalar-or-
      not="scalar" />
  </arguments>
  - <conditions>
    - <complete-condition>
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="fasting-glucose-
              monitoring" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="good" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </complete-condition>
    - <abort-condition>
      - <simple-condition>
        - <comparison type="greater-or-equal">
          - <left-hand-side>
            <parameter-ref name="evening-dose" />
          </left-hand-side>
          - <right-hand-side>
            <numerical-constant value="40" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </abort-condition>
  </conditions>
  - <plan-body>
    - <cyclical-plan>
      - <cyclical-plan-body>
        - <plan-activation>
          - <plan-schema name="Test-glucose-and-adapt-
            evening-insulin">
            - <argument-value name="evening-dose">
              <variable-ref name="evening-dose" />
            </argument-value>
            <return-value-assignment return-value-
              name="out-evening-dose" variable-
              name="evening-dose" />
          </plan-schema>
        </plan-activation>
      </cyclical-plan-body>
    </cyclical-plan>
  </plan-body>
</plan>

```

```

        </plan-activation>
    </cyclical-plan-body>
    <!-- Adapt once a week (flexibly). -->
- <repeat-specification>
- <retry-delay include-limit-value="yes">
- <minimum>
    <numerical-constant scale="time" unit="d"
    value="7" />
    </minimum>
- <maximum>
    <numerical-constant scale="time" unit="d"
    value="10" />
    </maximum>
    </retry-delay>
    </repeat-specification>
    </cyclical-plan>
</plan-body>
- <returns>
- <return-value name="out-evening-dose">
    <variable-ref name="evening-dose" />
    </return-value>
    </returns>
</plan>
- <plan name="Test-glucose-and-adapt-evening-insulin">
- <arguments>
    <argument name="evening-dose" type="amount" scalar-or-
    not="scalar" />
    </arguments>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
- <wait-for>
    <all />
    </wait-for>
- <plan-activation>
    <plan-schema name="Four-points-day-curve" />
    </plan-activation>
    <!-- A Display would be needed HERE!!! (to display both
    the glucose values and the currrend dose) -->
- <ask>
    <parameter-ref name="evening-adaptation" />
- <time-out>
    <now />
    </time-out>
    </ask>
    </subplans>
    </plan-body>
- <returns>
- <return-value name="out-evening-dose">
- <operation operator="add">
    <variable-ref name="evening-dose" />
    <parameter-ref name="evening-adaptation" />
    </operation>
    </return-value>
    </returns>
</plan>

```

```

- <plan name="Change-insulin-to-2dd">
- <arguments>
  <argument name="evening-dose" type="amount" scalar-or-not="scalar" />
</arguments>
- <value-defs>
  <variable-def name="dd" type="amount" rounding="nearest" scalar-or-not="scalar" />
  <variable-def name="evening-intake" type="insulin-intake-scale" rounding="nearest" scalar-or-not="scalar" />
  <variable-def name="morning-dose" type="amount" rounding="nearest" scalar-or-not="scalar" />
  <variable-def name="morning-intake" type="insulin-intake-scale" rounding="nearest" scalar-or-not="scalar" />
</value-defs>
- <conditions>
- <filter-precondition>
  <!-- To complete!!! (add filter condition for 'considerable postprandial hyperglycemia') -->
- <simple-condition>
- <simple-condition-combination type="or">
- <comparison type="greater-or-equal">
- <left-hand-side>
  <variable-ref name="evening-dose" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant value="40" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="postprandial-glucose-monitoring" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="bad" />
</right-hand-side>
</comparison>
</simple-condition-combination>
</simple-condition>
</filter-precondition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no" retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <variable-assignment variable="DMT2-treatment">
  <string-constant value="insulin" />
</variable-assignment>
  <!-- To complete!!! (remove info about previous oral drugs) -->
- <variable-assignment variable="dd">
  <numerical-constant value="2" />
</variable-assignment>

```

```

- <variable-assignment variable="evening-intake">
  <qualitative-constant value="before-meal" />
</variable-assignment>
- <ask>
  <parameter-ref name="par-morning-insulin-dose" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <variable-assignment variable="morning-dose">
  <parameter-ref name="par-morning-insulin-dose" />
</variable-assignment>
- <variable-assignment variable="morning-intake">
  <qualitative-constant value="before-meal" />
</variable-assignment>
<!-- The evening dose remains the same. -->
- <plan-activation>
  - <plan-schema name="Find-morning-insulin-dose">
    - <argument-value name="morning-dose">
      <variable-ref name="morning-dose" />
    </argument-value>
    <return-value-assignment return-value-name="out-
      morning-dose" variable-name="morning-dose" />
    </plan-schema>
  </plan-activation>
</subplans>
</plan-body>
- <returns>
  - <return-value name="out-dd">
    <variable-ref name="dd" />
  </return-value>
  - <return-value name="out-evening-intake">
    <variable-ref name="evening-intake" />
  </return-value>
  - <return-value name="out-morning-dose">
    <variable-ref name="morning-dose" />
  </return-value>
  - <return-value name="out-morning-intake">
    <variable-ref name="morning-intake" />
  </return-value>
</returns>
</plan>
- <plan name="Find-morning-insulin-dose">
  - <arguments>
    <argument name="morning-dose" type="amount" scalar-or-
      not="scalar" />
  </arguments>
  - <conditions>
    - <complete-condition>
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="postprandial-glucose-
              monitoring" />
          </left-hand-side>
          - <right-hand-side>

```

```

        <qualitative-constant value="good" />
    </right-hand-side>
</comparison>
</simple-condition>
</complete-condition>
</conditions>
- <plan-body>
- <cyclical-plan>
    - <cyclical-plan-body>
        - <plan-activation>
            - <plan-schema name="Test-glucose-and-adapt-
              morning-insulin">
                - <argument-value name="morning-dose">
                    <variable-ref name="morning-dose" />
                </argument-value>
                <return-value-assignment return-value-
                  name="out-morning-dose" variable-
                  name="morning-dose" />
            </plan-schema>
        </plan-activation>
    </cyclical-plan-body>
    - <repeat-specification>
        <!-- Adapt once a week (flexibly). -->
        - <retry-delay include-limit-value="yes">
            - <minimum>
                <numerical-constant scale="time" unit="d"
                  value="7" />
            </minimum>
            - <maximum>
                <numerical-constant scale="time" unit="d"
                  value="10" />
            </maximum>
        </retry-delay>
    </repeat-specification>
</cyclical-plan>
</plan-body>
- <returns>
    - <return-value name="out-morning-dose">
        <variable-ref name="morning-dose" />
    </return-value>
</returns>
</plan>
- <plan name="Test-glucose-and-adapt-morning-insulin">
    - <arguments>
        <argument name="morning-dose" type="amount" scalar-or-
          not="scalar" />
    </arguments>
    - <plan-body>
        - <subplans type="sequentially" wait-for-optional-subplans="no"
          retry-aborted-subplans="no">
            - <wait-for>
                <all />
            </wait-for>
            - <plan-activation>
                <plan-schema name="Four-points-day-curve" />
            </plan-activation>
        </subplans>
    </plan-body>
</plan>

```

```

    <!-- A Display would be needed HERE!!! (to display both
    the glucose values and the current dose) -->
  - <ask>
    <parameter-ref name="morning-adaptation" />
    - <time-out>
      <now />
    </time-out>
  </ask>
</subplans>
</plan-body>
- <returns>
  - <return-value name="out-morning-dose">
    - <operation operator="add">
      <variable-ref name="morning-dose" />
      <parameter-ref name="morning-adaptation" />
    </operation>
  </return-value>
</returns>
</plan>
- <plan name="Only-insulin-treatment">
  - <value-defs>
    <variable-def name="insulin-dd" type="amount"
      rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="insulin-type" type="insulin-type"
      rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="evening-insulin-dose" type="amount"
      rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="evening-insulin-intake" type="insulin-
      intake-scale" rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="morning-insulin-dose" type="amount"
      rounding="nearest" scalar-or-not="scalar" />
    <variable-def name="morning-insulin-intake" type="insulin-
      intake-scale" rounding="nearest" scalar-or-not="scalar" />
  </value-defs>
  - <intentions>
    <refer-to label="avoid-bad-glucose-values" plan-
      name="Policy" />
  </intentions>
  <conditions />
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <all />
      </wait-for>
      - <variable-assignment variable="DMT2-treatment">
        <string-constant value="insulin" />
      </variable-assignment>
      <!-- To complete!!! (remove info about the previous
      oral drugs) -->
      - <ask>
        <parameter-ref name="par-insulin-type" />
        - <time-out>
          <now />
        </time-out>
      </ask>
    </subplans>
  </plan-body>
</plan>

```

```

- <variable-assignment variable="insulin-type">
  <parameter-ref name="par-insulin-type" />
</variable-assignment>
- <variable-assignment variable="insulin-dd">
  <numerical-constant value="2" />
</variable-assignment>
- <variable-assignment variable="morning-insulin-dose">
  <numerical-constant value="12" />
</variable-assignment>
- <variable-assignment variable="morning-insulin-intake">
  <qualitative-constant value="before-meal" />
</variable-assignment>
- <variable-assignment variable="evening-insulin-dose">
  <numerical-constant value="6" />
</variable-assignment>
- <variable-assignment variable="evening-insulin-intake">
  <qualitative-constant value="before-meal" />
</variable-assignment>
- <plan-activation>
  - <plan-schema name="Find-insulin-doses">
    - <argument-value name="evening-dose">
      <variable-ref name="evening-insulin-dose" />
    </argument-value>
    - <argument-value name="morning-dose">
      <variable-ref name="morning-insulin-dose" />
    </argument-value>
    <return-value-assignment return-value-name="out-
      evening-dose" variable-name="evening-insulin-
      dose" />
    <return-value-assignment return-value-name="out-
      morning-dose" variable-name="morning-insulin-
      dose" />
    </plan-schema>
  </plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Find-insulin-doses">
  - <arguments>
    <argument name="morning-dose" type="amount" scalar-or-
      not="scalar" />
    <argument name="evening-dose" type="amount" scalar-or-
      not="scalar" />
  </arguments>
  - <conditions>
    - <complete-condition>
      - <simple-condition>
        - <comparison type="not-equal">
          - <left-hand-side>
            <parameter-ref name="glucose-monitoring" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="bad" />
          </right-hand-side>
        </comparison>
      </simple-condition>

```

```

    </complete-condition>
  </conditions>
- <plan-body>
- <cyclical-plan>
  - <cyclical-plan-body>
    - <plan-activation>
      - <plan-schema name="Test-glucose-and-adapt-
        insulin">
        - <argument-value name="evening-dose">
          <variable-ref name="evening-dose" />
        </argument-value>
        - <argument-value name="morning-dose">
          <variable-ref name="morning-dose" />
        </argument-value>
        <return-value-assignment return-value-
          name="out-evening-dose" variable-
          name="evening-dose" />
        <return-value-assignment return-value-
          name="out-morning-dose" variable-
          name="morning-dose" />
      </plan-schema>
    </plan-activation>
  </cyclical-plan-body>
- <repeat-specification>
  - <retry-delay include-limit-value="yes">
    - <minimum>
      <numerical-constant scale="time" unit="d"
        value="2" />
    </minimum>
    - <maximum>
      <numerical-constant scale="time" unit="d"
        value="3" />
    </maximum>
  </retry-delay>
</repeat-specification>
</cyclical-plan>
</plan-body>
- <returns>
  - <return-value name="out-evening-dose">
    <variable-ref name="evening-dose" />
  </return-value>
  - <return-value name="out-morning-dose">
    <variable-ref name="morning-dose" />
  </return-value>
</returns>
</plan>
- <plan name="Test-glucose-and-adapt-insulin">
  - <arguments>
    <argument name="evening-dose" type="amount" scalar-or-
      not="scalar" />
    <argument name="morning-dose" type="amount" scalar-or-
      not="scalar" />
  </arguments>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>

```

```

        <all />
    </wait-for>
- <plan-activation>
    <plan-schema name="Four-points-day-curve" />
</plan-activation>
<!-- A Display would be needed HERE!!! (to display both
the glucose values and the current doses) -->
- <ask>
    <parameter-ref name="evening-adaptation" />
    - <time-out>
        <now />
    </time-out>
</ask>
- <ask>
    <parameter-ref name="morning-adaptation" />
    - <time-out>
        <now />
    </time-out>
</ask>
</subplans>
</plan-body>
- <returns>
- <return-value name="out-evening-dose">
    - <operation operator="add">
        <variable-ref name="evening-dose" />
        <parameter-ref name="evening-adaptation" />
    </operation>
</return-value>
- <return-value name="out-morning-dose">
    - <operation operator="add">
        <variable-ref name="morning-dose" />
        <parameter-ref name="morning-adaptation" />
    </operation>
</return-value>
</returns>
</plan>
<!-- Related treatments -->
- <plan name="Treatment-of-CV-disease-risk-factors">
- <plan-body>
    - <subplans type="unordered" wait-for-optional-subplans="yes"
        retry-aborted-subplans="no">
    - <wait-for>
        <none />
    </wait-for>
    <!-- To review!!! (all the previous) -->
    - <plan-activation>
        <plan-schema name="Hypertension-treatment" />
    </plan-activation>
    - <plan-activation>
        <plan-schema name="Cholesterol-treatment" />
    </plan-activation>
    <!-- There will be a plan-activation Microalbuminuria-
        treatment here -->
    </subplans>
</plan-body>
</plan>

```

- <plan name="Hypertension-treatment" title="Refer to NHG Hypertension protocol">
 - <conditions>
 - <filter-precondition>
 - <simple-condition>
 - <simple-condition-combination type="or">
 - <comparison type="greater-than">
 - <left-hand-side>
 - <parameter-ref name="higher-blood-pressure" />
 - </left-hand-side>
 - <right-hand-side>
 - <numerical-constant value="150" />
 - </right-hand-side>
 - </comparison>
 - <comparison type="greater-than">
 - <left-hand-side>
 - <parameter-ref name="lower-blood-pressure" />
 - </left-hand-side>
 - <right-hand-side>
 - <numerical-constant value="85" />
 - </right-hand-side>
 - </comparison>
 - </simple-condition-combination>
 - </simple-condition>
 - </filter-precondition>
 - </conditions>
 - <plan-body>
 - <user-performed />
 - </plan-body>
 - </plan>
 - <plan name="Cholesterol-treatment" title="Refer to NHG Cholesterol protocol">
 - <conditions>
 - <filter-precondition>
 - <simple-condition>
 - <simple-condition-combination type="or">
 - <simple-condition-combination type="and">
 - <comparison type="equal">
 - <left-hand-side>
 - <variable-ref name="fat-metabolism-problems" />
 - </left-hand-side>
 - <right-hand-side>
 - <qualitative-constant value="true" />
 - </right-hand-side>
 - </comparison>
 - <comparison type="greater-than">
 - <left-hand-side>
 - <variable-ref name="life-expectancy" />
 - </left-hand-side>
 - <right-hand-side>
 - <numerical-constant value="5" />
 - </right-hand-side>
 - </comparison>

```

- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="CV-diseases" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
- <comparison type="greater-than">
- <left-hand-side>
  <parameter-ref name="total-
    cholesterol" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant value="5" />
</right-hand-side>
</comparison>
</simple-condition-combination>
- <simple-condition-combination type="and">
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="fat-metabolism-
    problems" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="true" />
</right-hand-side>
</comparison>
- <comparison type="greater-than">
- <left-hand-side>
  <variable-ref name="life-expectancy" />
</left-hand-side>
- <right-hand-side>
  <numerical-constant value="5" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="CV-diseases" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant value="false" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <parameter-ref name="CH-disease-
    risk" />
</left-hand-side>
- <right-hand-side>
  <qualitative-constant
    value="significant" />
</right-hand-side>
</comparison>
</simple-condition-combination>
</simple-condition-combination>

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```

        </simple-condition>
      </filter-precondition>
    </conditions>
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Microalbuminuria-treatment">
  - <conditions>
    - <filter-precondition>
      - <simple-condition>
        - <simple-condition-combination type="and">
          - <comparison type="less-than">
            - <left-hand-side>
              <variable-ref name="age" />
            </left-hand-side>
          - <right-hand-side>
            <numerical-constant value="50" />
          </right-hand-side>
        </comparison>
        - <comparison type="equal">
          - <left-hand-side>
            <variable-ref name="microalbuminuria" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="yes" />
          </right-hand-side>
        </comparison>
      </simple-condition-combination>
    </simple-condition>
  </filter-precondition>
</conditions>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"
      retry-aborted-subplans="no">
      - <wait-for>
        <all />
      </wait-for>
      - <ask>
        <parameter-ref name="drug-name" />
      - <time-out>
        <now />
      </time-out>
    </ask>
    - <put-last list="ACE-inhibitors">
      - <element>
        <parameter-ref name="drug-name" />
      </element>
    </put-last>
    - <plan-activation>
      - <plan-schema name="Initialise-drug-doses">
        - <argument-value name="drugs">
          <variable-ref name="ACE-inhibitors" />
        </argument-value>
        - <argument-value name="iterator-drugs">
          <variable-ref name="iterator-ACE-inhibitors" />

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        </argument-value>
      - <argument-value name="drug-doses">
        <variable-ref name="ACE-inhibitor-doses" />
      </argument-value>
      - <argument-value name="iterator-drug-doses">
        <variable-ref name="iterator-ACE-inhibitor-
          doses" />
      </argument-value>
      <return-value-assignment return-value-name="out-
        drug-doses" variable-name="ACE-inhibitor-
        doses" />
    </plan-schema>
  </plan-activation>
- <plan-activation>
  - <plan-schema name="Find-ACE-inhibitor-doses">
    - <argument-value name="drugs">
      <variable-ref name="ACE-inhibitors" />
    </argument-value>
    - <argument-value name="iterator-drugs">
      <variable-ref name="iterator-ACE-inhibitors" />
    </argument-value>
    - <argument-value name="drug-doses">
      <variable-ref name="ACE-inhibitor-doses" />
    </argument-value>
    - <argument-value name="iterator-drug-doses">
      <variable-ref name="iterator-ACE-inhibitor-
        doses" />
    </argument-value>
    <return-value-assignment return-value-name="out-
      drug-doses" variable-name="ACE-inhibitor-
      doses" />
  </plan-schema>
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Find-ACE-inhibitor-doses">
  - <arguments>
    <argument name="drugs" scalar-or-not="list" type="String" />
    <argument name="iterator-drugs" type="iterator" scalar-or-
      not="scalar" />
    <argument name="drug-doses" scalar-or-not="list"
      type="amount" />
    <argument name="iterator-drug-doses" type="iterator" scalar-
      or-not="scalar" />
  </arguments>
  - <conditions>
    - <complete-condition>
      - <simple-condition label="blood-pressure-goal-for-
        microalbuminuria">
        - <simple-condition-combination type="and">
          - <comparison type="less-or-equal">
            - <left-hand-side>
              <parameter-ref name="higher-blood-
                pressure" />
            </left-hand-side>
          - <right-hand-side>

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        <numerical-constant value="140" />
      </right-hand-side>
    </comparison>
  - <comparison type="less-or-equal">
    - <left-hand-side>
      <parameter-ref name="lower-blod-
        pressure" />
    </left-hand-side>
    - <right-hand-side>
      <numerical-constant value="80" />
    </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition>
</complete-condition>
- <abort-condition>
- <simple-condition>
  - <simple-condition-combination type="and">
    - <comparison type="equal">
      - <left-hand-side>
        <parameter-ref name="ACE-inhibitor-
          maximal-doses" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="true" />
      </right-hand-side>
    </comparison>
    <!-- ...though I would prefer simple-condition-
      not + refer-to blood-pressure-goal-for-microalbuminuria instead .
  - <simple-condition-combination type="or">
    - <comparison type="greater-than">
      - <left-hand-side>
        <parameter-ref name="higher-blood-
          pressure" />
      </left-hand-side>
      - <right-hand-side>
        <numerical-constant value="140" />
      </right-hand-side>
    </comparison>
    - <comparison type="greater-than">
      - <left-hand-side>
        <parameter-ref name="lower-blod-
          pressure" />
      </left-hand-side>
      - <right-hand-side>
        <numerical-constant value="80" />
      </right-hand-side>
    </comparison>
  </simple-condition-combination>
</simple-condition-combination>
</simple-condition>
</abort-condition>
</conditions>
- <plan-body>
  - <cyclical-plan>
    - <cyclical-plan-body>

```

```

- <plan-activation>
- <plan-schema name="Increase-drug-doses">
- <argument-value name="drugs">
  <variable-ref name="drugs" />
</argument-value>
- <argument-value name="iterator-drugs">
  <variable-ref name="iterator-drugs" />
</argument-value>
- <argument-value name="drug-doses">
  <variable-ref name="drug-doses" />
</argument-value>
- <argument-value name="iterator-drug-doses">
  <variable-ref name="iterator-drug-doses" />
</argument-value>
  <return-value-assignment return-value-
    name="out-drug-doses" variable-name="drug-
      doses" />
</plan-schema>
</plan-activation>
</cyclical-plan-body>
- <repeat-specification>
  <!-- To review! (not clear what is the
    periodicity) -->
- <retry-delay include-limit-value="yes">
- <minimum>
  <numerical-constant scale="time" unit="w"
    value="2" />
</minimum>
- <maximum>
  <numerical-constant scale="time" unit="w"
    value="4" />
</maximum>
</retry-delay>
</repeat-specification>
</cyclical-plan>
</plan-body>
- <returns>
- <return-value name="out-drug-doses">
  <variable-ref name="drug-doses" />
</return-value>
</returns>
</plan>
<!-- Periodical controls -->
- <plan name="Quarterly-control">
- <plan-body>
- <subplans type="any-order" wait-for-optional-subplans="no"
  retry-aborted-subplans="no">
- <wait-for>
  <all />
</wait-for>
- <ask>
  <parameter-ref name="wellbeing" />
- <time-out>
  <now />
</time-out>
</ask>

```

```

- <ask>
  <parameter-ref name="hypoglycemia" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="feeding-problems" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="treatment-problems" />
- <time-out>
  <now />
</time-out>
</ask>
- <ask>
  <parameter-ref name="weight" />
- <time-out>
  <now />
</time-out>
</ask>
- <if-then-else>
- <simple-condition>
- <simple-condition-combination type="or">
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="DMT2-treatment" />
</left-hand-side>
- <right-hand-side>
  <string-constant value="insulin" />
</right-hand-side>
</comparison>
- <comparison type="equal">
- <left-hand-side>
  <variable-ref name="DMT2-treatment" />
</left-hand-side>
- <right-hand-side>
  <string-constant
    value="insulin+antidiabetics" />
  </right-hand-side>
</comparison>
</simple-condition-combination>
</simple-condition>
- <then-branch>
- <plan-activation>
  <plan-schema name="Four-points-day-curve" />
</plan-activation>
</then-branch>
- <else-branch>
- <plan-activation>
  <plan-schema name="Fasting-glucose-test" />
</plan-activation>
</else-branch>

```

```

    </if-then-else>
  - <subplans type="sequentially" wait-for-optional-
    subplans="no" retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
    - <ask>
      <parameter-ref name="feet-problems" />
    - <time-out>
      <now />
    </time-out>
    </ask>
  - <if-then-else>
    - <simple-condition>
      - <comparison type="equal">
        - <left-hand-side>
          <parameter-ref name="feet-problems" />
        </left-hand-side>
        - <right-hand-side>
          <qualitative-constant value="true" />
        </right-hand-side>
      </comparison>
    </simple-condition>
    - <then-branch>
      - <plan-activation>
        <plan-schema name="Feet-investigation" />
      </plan-activation>
    </then-branch>
  </if-then-else>
</subplans>
</subplans>
</plan-body>
</plan>
- <plan name="Annual-control">
- <plan-body>
  - <subplans type="any-order" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
    - <wait-for>
      <all />
    </wait-for>
    - <plan-activation>
      <plan-schema name="Quarterly-control" />
    </plan-activation>
    - <ask>
      <parameter-ref name="visus-problems" />
    - <time-out>
      <now />
    </time-out>
    </ask>
    - <ask>
      <parameter-ref name="CV-problems" />
    - <time-out>
      <now />
    </time-out>
    </ask>
  - <ask>

```

```

    <parameter-ref name="neuropathy" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="sexual-problems" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="higher-blood-pressure" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="lower-blood-pressure" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <plan-activation>
  <plan-schema name="Feet-investigation" />
</plan-activation>
- <if-then-else>
  - <simple-condition>
    - <simple-condition-combination type="or">
      - <comparison type="equal">
        - <left-hand-side>
          <variable-ref name="DMT2-treatment" />
        </left-hand-side>
        - <right-hand-side>
          <string-constant value="insulin" />
        </right-hand-side>
      </comparison>
      - <comparison type="equal">
        - <left-hand-side>
          <variable-ref name="DMT2-treatment" />
        </left-hand-side>
        - <right-hand-side>
          <string-constant
            value="insulin+antidiabetics" />
          </right-hand-side>
        </comparison>
      </simple-condition-combination>
    </simple-condition>
    - <then-branch>
      - <plan-activation>
        <plan-schema name="Injection-points-
          investigation" />
      </plan-activation>
    </then-branch>
  </if-then-else>
- <ask>

```

```

    <parameter-ref name="GHb" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <ask>
  <parameter-ref name="creatinin" />
  - <time-out>
    <now />
  </time-out>
</ask>
- <if-then-else>
  - <simple-condition>
    - <comparison type="equal">
      - <left-hand-side>
        <variable-ref name="cholesterol-
          treatment" />
      </left-hand-side>
      - <right-hand-side>
        <qualitative-constant value="false" />
      </right-hand-side>
    </comparison>
  </simple-condition>
  - <then-branch>
    - <plan-activation>
      <plan-schema name="Cholesterol-tests" />
    </plan-activation>
  </then-branch>
</if-then-else>
- <if-then-else>
  - <simple-condition>
    - <comparison type="less-than">
      - <left-hand-side>
        <variable-ref name="age" />
      </left-hand-side>
      - <right-hand-side>
        <numerical-constant unit="y" value="50" />
      </right-hand-side>
    </comparison>
  </simple-condition>
  - <then-branch>
    - <plan-activation>
      <plan-schema name="Albumin-test" />
    </plan-activation>
  </then-branch>
</if-then-else>
- <plan-activation>
  <plan-schema name="Funduscopy" />
</plan-activation>
</subplans>
</plan-body>
</plan>
- <plan name="Injection-points-investigation" title="Perform an
  investigation of injection points">
  - <plan-body>
    <user-performed />

```

```

    </plan-body>
  </plan>
- <plan name="Funduscopy" title="Perform a funduscopy">
  - <plan-body>
    <user-performed />
  </plan-body>
</plan>
<!-- Policy for related diseases -->
- <plan name="Policy-for-simultaneous-diseases">
  - <conditions>
    - <filter-precondition>
      - <simple-condition>
        - <simple-condition-combination type="or">
          - <comparison type="equal">
            - <left-hand-side>
              <variable-ref name="fever" />
            </left-hand-side>
            - <right-hand-side>
              <qualitative-constant value="true" />
            </right-hand-side>
          </comparison>
          - <comparison type="equal">
            - <left-hand-side>
              <variable-ref name="vomiting" />
            </left-hand-side>
            - <right-hand-side>
              <qualitative-constant value="true" />
            </right-hand-side>
          </comparison>
          - <comparison type="equal">
            - <left-hand-side>
              <variable-ref name="diarrhea" />
            </left-hand-side>
            - <right-hand-side>
              <qualitative-constant value="true" />
            </right-hand-side>
          </comparison>
        </simple-condition-combination>
      </simple-condition>
    </filter-precondition>
    - <abort-condition>
      - <simple-condition>
        - <comparison type="equal">
          - <left-hand-side>
            <parameter-ref name="simultaneous-diseases-over" />
          </left-hand-side>
          - <right-hand-side>
            <qualitative-constant value="true" />
          </right-hand-side>
        </comparison>
      </simple-condition>
    </abort-condition>
  </conditions>
  - <plan-body>
    - <subplans type="sequentially" wait-for-optional-subplans="no"

```

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    retry-aborted-subplans="no">
- <wait-for>
    <all />
  </wait-for>
- <plan-activation>
    <plan-schema name="Extra-fluid-intake-
      prescription" />
  </plan-activation>
- <plan-activation>
    <plan-schema name="Glucose-lowering-therapy-
      advices" />
  </plan-activation>
- <ask>
    <parameter-ref name="simultaneous-diseases-over" />
    - <time-out>
        <now />
      </time-out>
    </ask>
  </subplans>
</plan-body>
</plan>
- <plan name="Glucose-lowering-therapy-advices" title="Temporary
  increase based on blood glucose levels. Never discontinue insulin,
  even if less food is consumed">
- <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Extra-fluid-intake-prescription" title="Prescribe extra
  fluid intake">
- <plan-body>
    <user-performed />
  </plan-body>
</plan>
- <plan name="Policy-for-hypoglycemic-coma">
- <conditions>
- <filter-precondition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
    <variable-ref name="hypoglycemic-coma" />
  </left-hand-side>
- <right-hand-side>
    <qualitative-constant value="true" />
  </right-hand-side>
  </comparison>
</simple-condition>
</filter-precondition>
- <abort-condition>
- <simple-condition>
- <comparison type="equal">
- <left-hand-side>
    <parameter-ref name="hypoglycemic-coma-
      over" />
  </left-hand-side>
- <right-hand-side>

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```

        <qualitative-constant value="true" />
    </right-hand-side>
</comparison>
</simple-condition>
</abort-condition>
</conditions>
- <plan-body>
- <subplans type="sequentially" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
- <wait-for>
    <all />
</wait-for>
- <subplans type="any-order" wait-for-optional-subplans="no"
    retry-aborted-subplans="no">
- <wait-for>
    <one />
</wait-for>
- <plan-activation>
    <plan-schema name="Glucose-solution-
        prescription-manual" />
</plan-activation>
- <plan-activation>
    <plan-schema name="Glucagon-prescription-
        manual" />
</plan-activation>
</subplans>
- <plan-activation>
- <plan-schema name="Carbohydrate-rich-feeding-
    prescription">
    <!-- To completE!!! (this should be delayed
        until the patient is back to conscious state) -->
</plan-schema>
</plan-activation>
- <plan-activation>
    <plan-schema name="Hypoglycemia-cause-
        investigation" />
</plan-activation>
- <ask>
    <parameter-ref name="hypoglycemic-coma-over" />
- <time-out>
    <now />
</time-out>
</ask>
</subplans>
</plan-body>
</plan>
- <plan name="Glucose-solution-prescription-manual" title="Prescribe
    glucose solution">
- <conditions>
    <activate-mode started="manual" />
</conditions>
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Glucagon-prescription-manual" title="Prescribe

```

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    glucagon">
- <conditions>
    <activate-mode started="manual" />
</conditions>
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Carbohydrate-rich-feeding-prescription"
    title="Prescribe carbohydrate rich feeding">
- <plan-body>
    <user-performed />
</plan-body>
</plan>
- <plan name="Hypoglycemia-cause-investigation" title="Perform a
    investigation of hypoglycemia cause">
- <plan-body>
    <user-performed />
</plan-body>
</plan>
    <!-- There will be a plan Consultation-and-referring here -->
</plan-group>
</plans>
</plan-library>

```