



gefyrá

# HL7 FHIR

für sichere und valide Daten

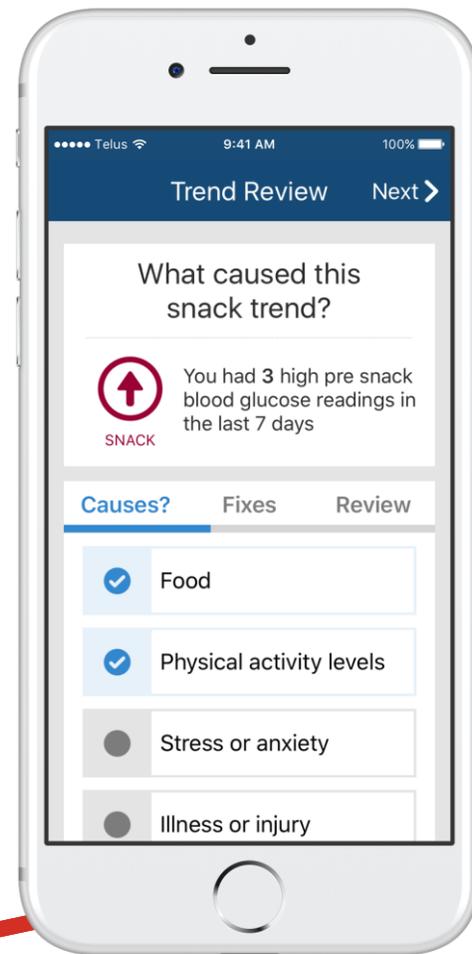
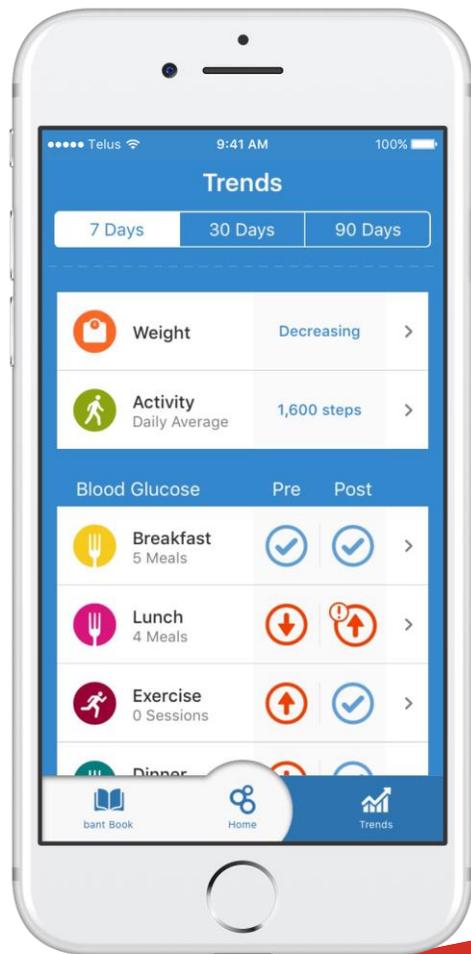
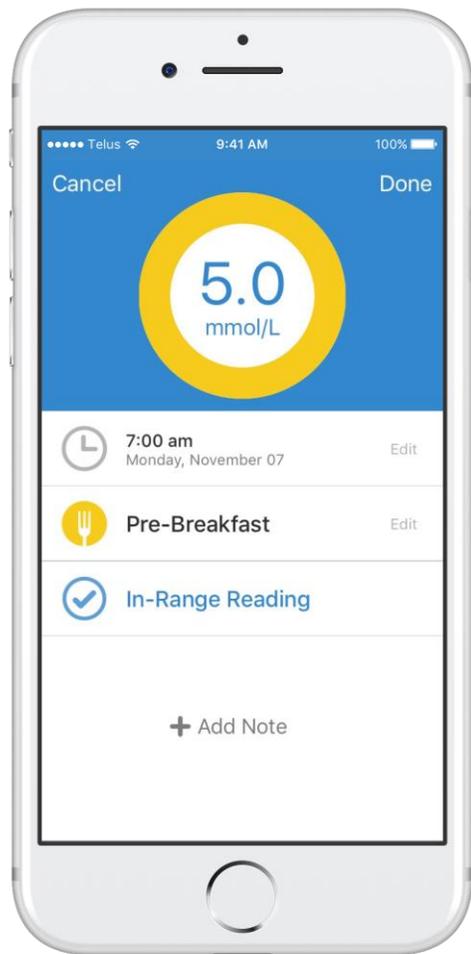
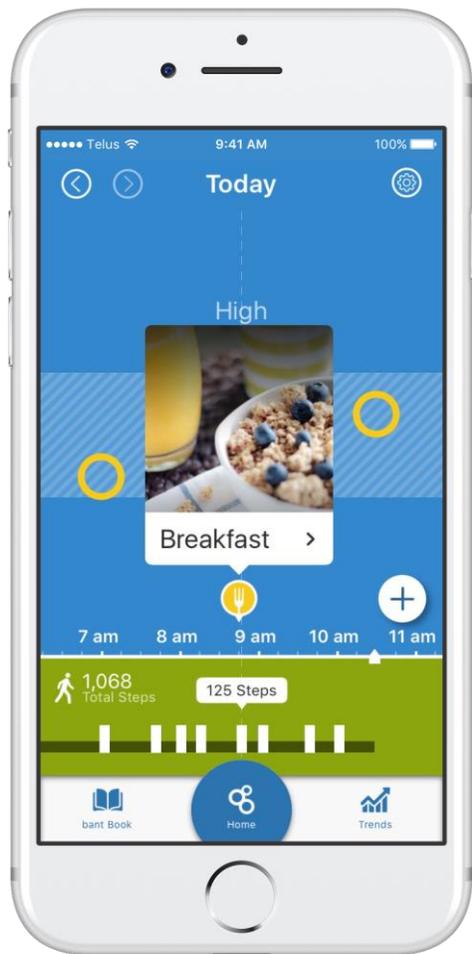
# Simone Heckmann



CTO / Technische Leiterin

✉ [sh@gefyra.de](mailto:sh@gefyra.de)

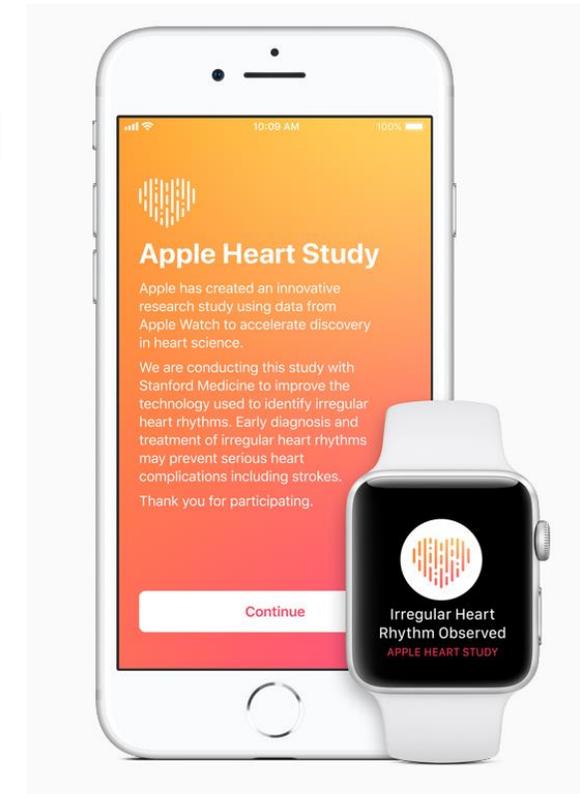
🐦 [@GefyraGmbH](https://twitter.com/GefyraGmbH)



# Meinung: Von Patienten (mit Apps, Wearables) erhobene Daten sind ein wichtiger Bestandteil einer ePA

gefyrá

- Ich stimme zu
- Ich stimme nicht zu
- Ich bin unentschlossen



# Frage: Was ist die größte Herausforderung bei der Integration solcher Daten?

- Autorisation & Authentifikation
- Nachvollziehbarkeit
- Validität der Daten
- Semantische Interoperabilität

# Was ist FHIR?

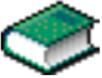
- ein Standard für webbasierte Kommunikation im Gesundheitswesen
- eine definierte Menge von Grundbausteinen (Ressourcen) für die Modellierung klinischer Daten
- die technische Grundlage maschinenlesbarer „Baupläne“ zur Erfassung und Validierung von Daten
- eine Community

# Authorisation & Authentifikation: OAUTH2+SMART

**Level 1** Basic framework on which the specification is built

 <b>Foundation</b>	Base Documentation, XML, JSON, Data Types, Extensions
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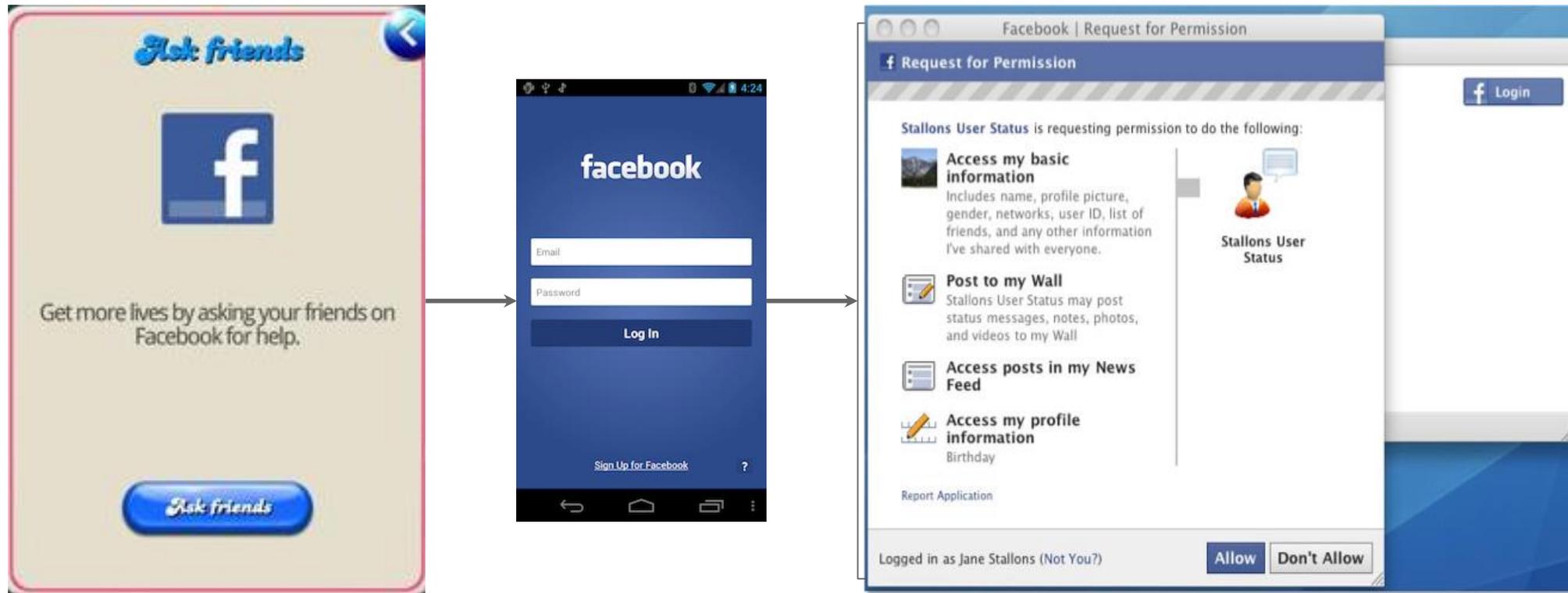
**Level 2** Supporting implementation and binding to external specifications

 <b>Implementer Support</b> Downloads, Version Mgmt, Use Cases, Testing	 <b>Security &amp; Privacy</b> Security, Consent, Provenance, AuditEvent	 <b>Conformance</b> StructureDefinition, CapabilityStatement, ImplementationGuide, Profiling	 <b>Terminology</b> CodeSystem, ValueSet, ConceptMap, Terminology Svc	 <b>Exchange</b> REST API + Search Documents Messaging Services Databases
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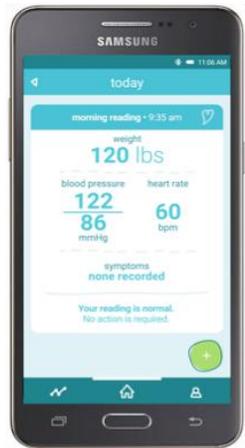
**Level 3** Linking to real world concepts in the healthcare system

 <b>Administration</b>	Patient, Practitioner, CareTeam, Device, Organization, Location, Healthcare Service
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# SMART: OAuth2



# SMART: OAuth2



## Authorizing SMART application: Medly

This application is requesting the following permissions:

- See Your Profile Information (name, email, contact details)
- Read Patient Information
- Write Clinical Observations

Authorize

Deny

# Nachvollziehbarkeit: Provenance

**Level 1** Basic framework on which the specification is built

 <b>Foundation</b>	Base Documentation, XML, JSON, Data Types, Extensions
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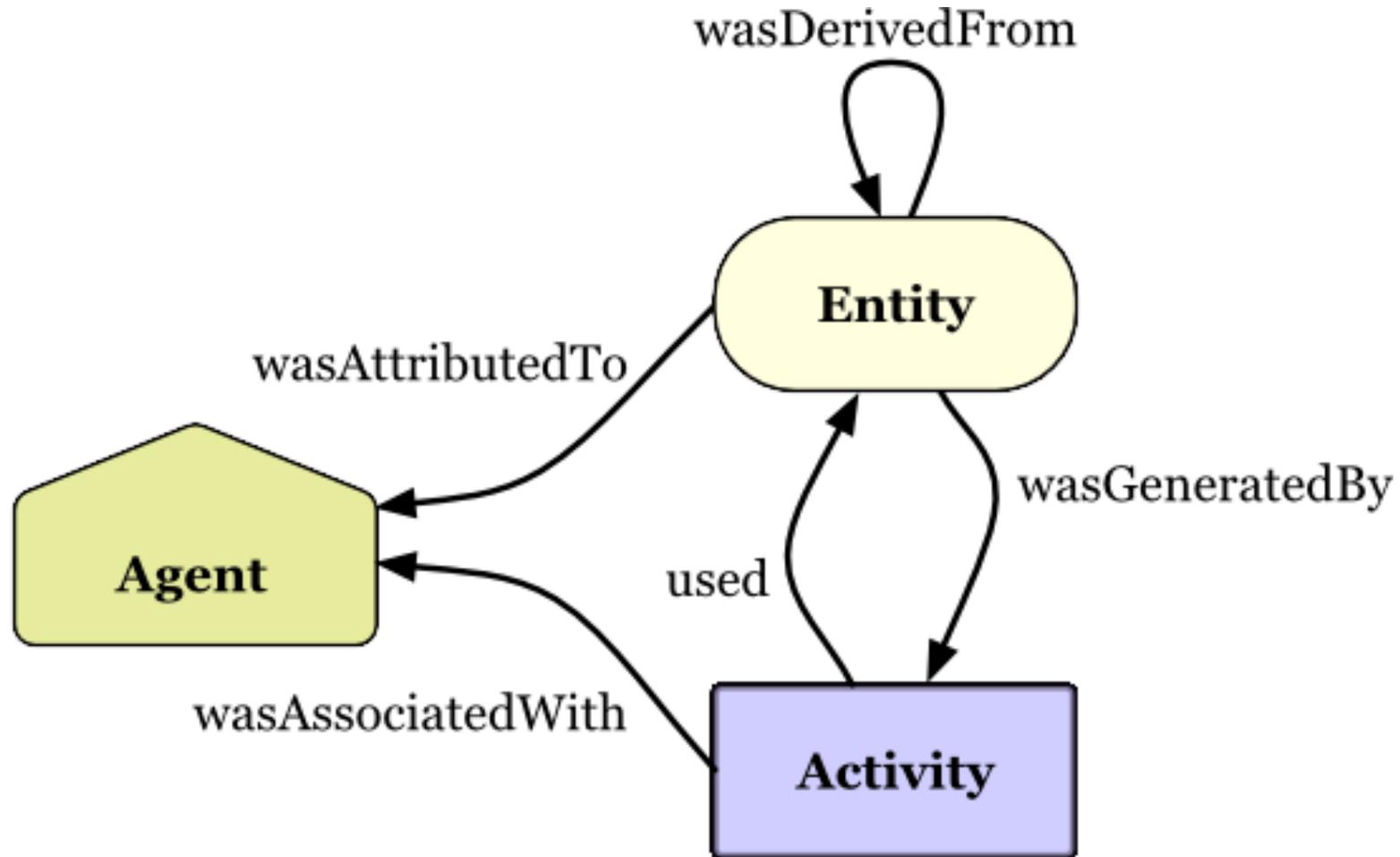
**Level 2** Supporting implementation and binding to external specifications

 <b>Implementer Support</b> Downloads, Version Mgmt, Use Cases, Testing	 <b>Security &amp; Privacy</b> Security, Consent, Provenance, AuditEvent	 <b>Conformance</b> StructureDefinition, CapabilityStatement, ImplementationGuide, Profiling	 <b>Terminology</b> CodeSystem, ValueSet, ConceptMap, Terminology Svc	 <b>Exchange</b> REST API + Search Documents Messaging Services Databases
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---	---

# Das W3C Provenance Modell



Name	Flags	Card.	Type	Description & Constraints
Provenance	TU		DomainResource	Who, What, When for a set of resources Elements defined in Ancestors: <a href="#">id</a> , <a href="#">meta</a> , <a href="#">implicitRules</a> , <a href="#">language</a> , <a href="#">text</a> , <a href="#">contained</a> , <a href="#">extends</a>
target	Σ	1..*	Reference(Any)	Target Reference(s) (usually version specific)
occurred[x]		0..1		When the activity occurred
occurredPeriod			Period	
occurredDateTime			dateTime	
recorded	Σ	1..1	instant	When the activity was recorded / updated
policy		0..*	uri	Policy or plan the activity was defined by
location		0..1	Reference(Location)	Where the activity occurred, if relevant
reason		0..*	CodeableConcept	Reason the activity is occurring <a href="#">PurposeOfUse</a> (Extensible)
activity		0..1	CodeableConcept	Activity that occurred <a href="#">ProvenanceActivityType</a> (Extensible)
agent		1..*	BackboneElement	Actor involved
type	Σ	0..1	CodeableConcept	How the agent participated <a href="#">ProvenanceParticipantType</a> (Extensible)
role		0..*	CodeableConcept	What the agents role was <a href="#">SecurityRoleType</a> (Example)
who[x]	Σ	1..1		Who participated
whoIdentifier			Identifier	
whoReference			Reference(Practitioner   PractitionerRole   RelatedPerson   Patient   Device   Organization)	
onBehalfOf[x]		0..1		Who the agent is representing
onBehalfOfIdentifier			Identifier	

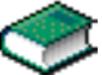
activity	0..1	CodeableConcept	Activity that occurred ProvenanceActivityType (Extensible)
agent	1..*	BackboneElement	Actor involved
type	Σ 0..1	CodeableConcept	How the agent participated ProvenanceParticipantType (Extensible)
role	0..*	CodeableConcept	What the agents role was SecurityRoleType (Example)
who[x]	Σ 1..1		Who participated
whoIdentifier		Identifier	
whoReference		Reference(Practitioner   PractitionerRole   RelatedPerson   Patient   Device   Organization)	
onBehalfOf[x]	0..1		Who the agent is representing
onBehalfOfIdentifier		Identifier	
onBehalfOfReference		Reference(Practitioner   PractitionerRole   RelatedPerson   Patient   Device   Organization)	
entity	0..*	BackboneElement	An entity used in this activity
role	Σ 1..1	code	derivation   revision   quotation   source   removal ProvenanceEntityRole (Required)
what[x]	Σ 1..1		Identity of entity
whatIdentifier		Identifier	
whatReference		Reference(Any)	
agent	0..*	see agent	Entity is attributed to this agent
signature	0..*	Signature	Signature on target

# Valide Daten: StructureDefinition

**Level 1** Basic framework on which the specification is built

 <b>Foundation</b>	Base Documentation, XML, JSON, Data Types, Extensions
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**Level 2** Supporting implementation and binding to external specifications

 <b>Implementer Support</b> Downloads, Version Mgmt, Use Cases, Testing	 <b>Security &amp; Privacy</b> Security, Consent, Provenance, AuditEvent	 <b>Conformance</b> StructureDefinition, CapabilityStatement, ImplementationGuide, Profiling	 <b>Terminology</b> CodeSystem, ValueSet, ConceptMap, Terminology Svc	 <b>Exchange</b> REST API + Search Documents Messaging Services Databases
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**Level 3** Linking to real world concepts in the healthcare system

 <b>Administration</b>	Patient, Practitioner, CareTeam, Device, Organization, Location, Healthcare Service
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# StructureDefinition

- “Bauplan” einer Resource, einer Extension, eines Datentyps, eines Dokumenttyps oder eines Profils
- “Werkzeug” zur Erstellung von Profilen
- StructureDefinitions
  - sind maschinenlesbar
  - in Registries online auffindbar
  - die Basis für Validierung, Code- und UI-Generierung
  - die Basis für die Erzeugung der Spezifikation

# Profilieren

- “Die Angabe der 10-stelligen Krankenversichertennr. ist erforderlich”
- “Die Diagnose muss mittels ICD-10-GM codiert sein”
- “Entlassbriefe müssen mindestens die Abschnitte ‘Medikation bei Entlassung’ und ‘Entlassdiagnose’ enthalten”
- “Unser PVS kann nur einen Namen pro Patient erfassen”

## Structure

Name	Flags	Card.	Type	Description & Constraints
 Observation	I <b>N</b>		DomainResource	Measurements and simple assertions + Rule: <i>dataAbsentReason SHALL only be present if Observation.value[x] is not present</i> + Rule: <i>If Observation.code is the same as an Observation.component.code then the value element associated with the code SHALL NOT be present</i> Elements defined in Ancestors: <a href="#">id</a> , <a href="#">meta</a> , <a href="#">implicitRules</a> , <a href="#">language</a> , <a href="#">text</a> , <a href="#">contained</a> , <a href="#">extension</a> , <a href="#">modifierExtension</a>
...  identifier	Σ	0..*	Identifier	Business Identifier for observation
...  basedOn	Σ	0..*	Reference(CarePlan   DeviceRequest   ImmunizationRecommendation   MedicationRequest   NutritionOrder   ServiceRequest)	Fulfills plan, proposal or order
...  partOf	Σ	0..*	Reference(MedicationAdministration   MedicationDispense   MedicationStatement   Procedure   Immunization   ImagingStudy)	Part of referenced event
...  status	?! Σ	1..1	code	registered   preliminary   final   amended + <a href="#">ObservationStatus (Required)</a>
...  category		0..*	CodeableConcept	Classification of type of observation <a href="#">Observation Category Codes (Preferred)</a>
...  code	Σ	1..1	CodeableConcept	Type of observation (code / type) <a href="#">LOINC Codes (Example)</a>
...  subject	Σ	0..1	Reference(Patient   Group   Device   Location)	Who and/or what the observation is about
...  focus	Σ <b>TU</b>	0..*	Reference(Any)	What the observation is about, when it is not about the subject of record
...  encounter	Σ	0..1	Reference(Encounter)	Healthcare event during which this observation is made
...  effective[x]	Σ	0..1		Clinically relevant time/time-period for observation
...  effectiveDateTime			<a href="#">dateTime</a>	
...  effectivePeriod			<a href="#">Period</a>	
...  effectiveTiming			<a href="#">Timing</a>	
...  effectiveInstant			<a href="#">instant</a>	
...  issued	Σ	0..1	<a href="#">instant</a>	Date/Time this version was made available

performer	Σ	0..*	Reference(Practitioner   PractitionerRole   Organization   CareTeam   Patient   RelatedPerson)	Who is responsible for the observation
value[x]	Σ I	0..1		Actual result
valueQuantity			Quantity	
valueCodeableConcept			CodeableConcept	
valueString			string	
valueBoolean			boolean	
valueInteger			integer	
valueRange			Range	
valueRatio			Ratio	
valueSampledData			SampledData	
valueTime			time	
valueDateTime			dateTime	
valuePeriod			Period	
dataAbsentReason	I	0..1	CodeableConcept	Why the result is missing <a href="#">DataAbsentReason (Extensible)</a>
interpretation		0..*	CodeableConcept	High, low, normal, etc. <a href="#">Observation Interpretation Codes (Extensible)</a>
note		0..*	Annotation	Comments about the observation
bodySite		0..1	CodeableConcept	Observed body part <a href="#">SNOMED CT Body Structures (Example)</a>
method		0..1	CodeableConcept	How it was done <a href="#">Observation Methods (Example)</a>
specimen		0..1	Reference(Specimen)	Specimen used for this observation
device		0..1	Reference(Device   DeviceMetric)	(Measurement) Device
referenceRange	I	0..*	BackboneElement	Provides guide for interpretation + Rule: Must have at least a low or a high or text
low	I	0..1	SimpleQuantity	Low Range, if relevant
high	I	0..1	SimpleQuantity	High Range, if relevant
type		0..1	CodeableConcept	Reference range qualifier <a href="#">Observation Reference Range Meaning Codes (Preferred)</a>
appliesTo		0..*	CodeableConcept	Reference range population <a href="#">Observation Reference Range Applies To Codes (Example)</a>

# Beispiel: Bauplan Herzfrequenz

Text Summary **Differential Table** Snapshot Table XML Template JSON Template All

This structure is derived from [observation-vitalsigns](#).

Name	Flags	Card.	Type	Description & Constraints
Observation		0..*		FHIR Heart Rate Profile
code		1..1	CodeableConcept	Heart Rate
coding			Coding	<b>Slice:</b> Unordered, Open by value:code, value:system
coding		1..1	Coding	
system		1..1	uri	<b>Fixed Value:</b> <a href="http://loinc.org">http://loinc.org</a>
code		1..1	code	<b>Fixed Value:</b> 8867-4
valueQuantity		0..1	Quantity	
value	S	1..1	decimal	
unit	S	1..1	string	
system	S	1..1	uri	<b>Fixed Value:</b> <a href="http://unitsofmeasure.org">http://unitsofmeasure.org</a>
code	S	1..1	code	Coded responses from the common UCUM units for vital signs value set. <b>Fixed Value:</b> /min

? Documentation for this format

# Instanz einer Herzfrequenz-Messung

```
<Observation xmlns="http://hl7.org/fhir">
  <id value="heart-rate"/>
  <meta>
    <profile value="http://hl7.org/fhir/StructureDefinition/vitalsigns"/>
  </meta>
  <code>
    <coding>
      <system value="http://loinc.org"/>
      <code value="8867-4"/>
      <display value="Heart rate"/>
    </coding>
  </code>
  <subject>
    <reference value="Patient/example"/>
  </subject>
  <effectiveDateTime value="2019-11-03"/>
  <valueQuantity>
    <value value="44"/>
    <unit value="beats/minute"/>
    <system value="http://unitsofmeasure.org"/>
    <code value="/min"/>
  </valueQuantity>
</Observation>
```

# FHIR-„Profiling“: Binden an Terminologien

PROJECT Archivar 4.0

Bookmark Validate API Tools Status Update Download Settings

## DMI DocumentReference (dPaaS)

Profile

type Profile on DocumentReference FHIR STU3 status Draft version none

Canonical <http://dmi.de/fhir/StructureDefinition/documentreference-dPaaS>

Overview Details Mappings Table XML JSON References History

```
<StructureDefinition>
  <id value="7312bd11-35d8-44d6-8f81-a37c22c9a282" />
  <meta>
    <lastUpdated value="2018-12-12T07:30:39.481+00:00" />
  </meta>
  <url value="http://dmi.de/fhir/StructureDefinition/documentreference-dPaaS" />
  <name value="DMI DocumentReference (dPaaS)" />
  <status value="draft" />
  <date value="2018-12-12T07:30:39.3402682+00:00" />
  <fhirVersion value="3.0.1" />
  <kind value="resource" />
  <abstract value="false" />
  <type value="DocumentReference" />
  <baseDefinition value="http://hl7.org/fhir/StructureDefinition/DocumentReference" />
  <derivation value="constraint" />
  <differential>
    <element id="DocumentReference.extension">
      <path value="DocumentReference.extension" />
      <slicing>
        <discriminator>
          <type value="value" />
          <path value="url" />
        </discriminator>
      </slicing>
    </element>
  </differential>
</StructureDefinition>
```

# Semantik: Terminologien

**Level 1** Basic framework on which the specification is built

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**Level 3** Linking to real world concepts in the healthcare system

 <b>Administration</b>	Patient, Practitioner, CareTeam, Device, Organization, Location, Healthcare Service
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## Konsolidierte Dokumentenliste

Konsolidierte Dokumentenliste

 type **CodeSystem** FHIR STU3 status **Draft** version **none**

Canonical

[Overview](#)
[Table](#)
[XML](#)
[JSON](#)
[References](#)
[History](#)

```

<CodeSystem>
  <url value="http://dmi.de/fhir/CodeSystem/kdl" />
  <identifier>
    <system value="urn:ietf:rfc:3986" />
    <value value="urn:oid:1.2.276.0.76.3.1.191.0.1.1" />
  </identifier>
  <name value="Konsolidierte Dokumentenliste" />
  <status value="draft" />
  <publisher value="DMI GmbH & Co. KG" />
  <contact>
    <name value="Abteilung für angewandte Medizininformatik" />
    <telecom>
      <system value="email" />
      <value value="medinf@dmi.de" />
    </telecom>
  </contact>
  <description value="Konsolidierte Dokumentenliste" />
  <valueSet value="http://dmi.de/fhir/ValueSet/kdl" />
  <content value="complete" />
  <count value="368" />
  <concept>
    <code value="AD010101" />
    <display value="Ärztliche Stellungnahme" />
  </concept>
  <concept>
    <code value="AD010102" />
    <display value="Durchgangsarztbericht" />
  </concept>
  <concept>
    <code value="AD010103" />
    <display value="Entlassungsbericht intern" />
  </concept>
  ..

```

## Konsolidierte Dokumentenliste

Konsolidierte Dokumentenliste

 type **CodeSystem** FHIR STU3 status **Draft** version **none**
Canonical <http://dmi.de/fhir/CodeSystem/kdl>
[Overview](#)
[Table](#)
[XML](#)
[JSON](#)
[References](#)
[History](#)

## CodeSystem 'Konsolidierte Dokumentenliste'

Canonical URL	<a href="http://dmi.de/fhir/CodeSystem/kdl">http://dmi.de/fhir/CodeSystem/kdl</a>
Published by	DMI GmbH & Co. KG
Status	Draft

Konsolidierte Dokumentenliste

### Contact Information

#### Abteilung für angewandte Medizininformatik

Email: [medinf@dmi.de](mailto:medinf@dmi.de)This code system <http://dmi.de/fhir/CodeSystem/kdl> defines the following codes:

Code	Display
AD010101	Ärztliche Stellungnahme
AD010102	Durchgangsarztbericht
AD010103	Entlassungsbericht intern
AD010104	Entlassungsbericht extern
AD010105	Reha-Bericht
AD010106	Verlegungsbericht intern
AD010107	Verlegungsbericht extern
AD010108	Vorläufiger Arztbericht
AD010109	Ärztlicher Befundbericht
AD010110	Ärztlicher Verlaufsbericht
AD010111	Ambulanzbrief
AD010112	Kurzarztbrief

## Mapping von KDL-Wert auf IHE-TypeCode

ConceptMap

 type **ConceptMap** FHIR **STU3** status **Draft** version **none**

 Canonical 
[Overview](#)
[Table](#)
[XML](#)
[JSON](#)
[References](#)
[History](#)

### ConceptMap 'Mapping von KDL-Wert auf IHE-TypeCode'

Canonical URL	http://dmi.de/fhir/ConceptMap/kdl-ihe-typecode
Published by	DMI GmbH & Co. KG im Auftrag des DVMD e.V.
Status	Draft

Mapping der KDL (konsolidierte Dokumentenliste) auf TypeCodes von IHE Deutschland

#### Contact Information

**Deutscher Verband Medizinischer Dokumentare e.V.**

Email: [dvmd@dvmd.de](mailto:dvmd@dvmd.de)

Website: <https://www.dvmd.de>

**Fachdienste Medizinische Dokumentation**

Email: [fmd-leisnig@dmi.de](mailto:fmd-leisnig@dmi.de)

**Abteilung für angewandte Medizininformatik**

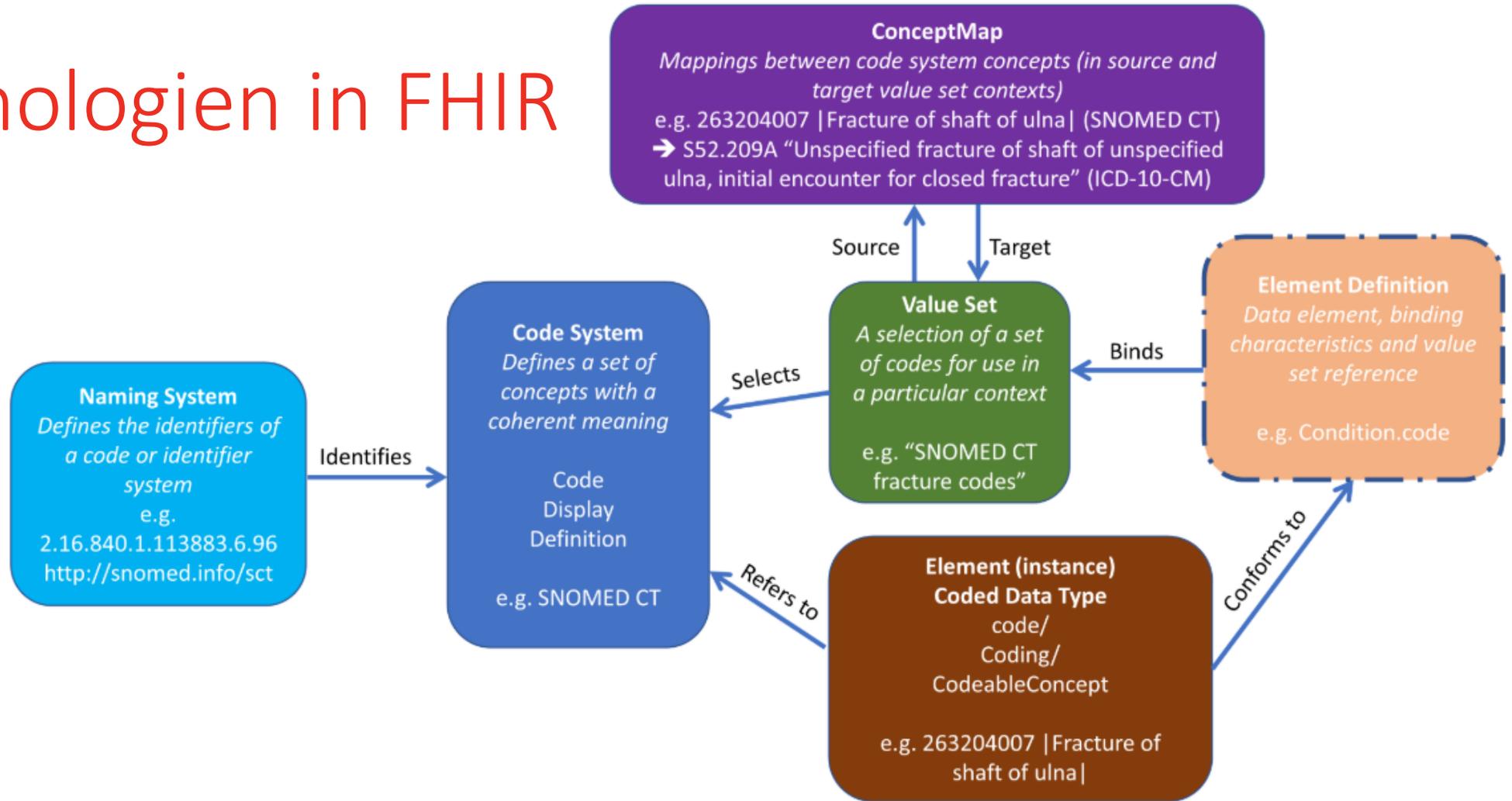
Email: [medinf@dmi.de](mailto:medinf@dmi.de)

### Mapping von KDL-Wert auf IHE-TypeCode (<http://dmi.de/fhir/ConceptMap/kdl-ihe-typecode>)

Mapping from [Konsolidierte Dokumentenliste](#) to <http://ihe-d.de/ValueSets/IHEXDStypeCode>

Source Code	Equivalence	Destination Code	Comment
AD010101 (Ärztliche Stellungnahme)	wider	BERI (Arztberichte)	
AD010102 (Durchgangsarztbericht)	wider	BERI (Arztberichte)	
AD010103 (Entlassungsbericht intern)	wider	BERI (Arztberichte)	
AD010104 (Entlassungsbericht extern)	wider	BERI (Arztberichte)	
AD010105 (Reha-Bericht)	wider	BERI (Arztberichte)	
AD010106 (Verlegungsbericht intern)	wider	BERI (Arztberichte)	
AD010107 (Verlegungsbericht extern)	wider	BERI (Arztberichte)	
AD010108 (Vorläufiger Arztbericht)	wider	BERI (Arztberichte)	
AD010109 (Ärztlicher Befundbericht)	wider	BERI (Arztberichte)	
AD010110 (Ärztlicher Verlaufsbericht)	wider	BERI (Arztberichte)	
AD010111 (Ambulanzbrief)	wider	BERI (Arztberichte)	
AD010112 (Kurzarztbrief)	wider	BERI (Arztberichte)	
AD010113 (Nachschaubericht)	wider	BERI (Arztberichte)	
AD010199 (Sonstiger Arztbericht)	wider	BERI (Arztberichte)	
AD020101 (Arbeitsunfähigkeitsbescheinigung)	wider	BESC (Ärztliche Bescheinigungen)	

# Terminologien in FHIR





gefyrda

we make fhir<sup>®</sup> work