

# A Personalised Integrated Care Approach for Service Organisations and Care Models for Patients with Multi-Morbidity and Chronic Conditions



## PICASO Patient Self-Monitoring Framework

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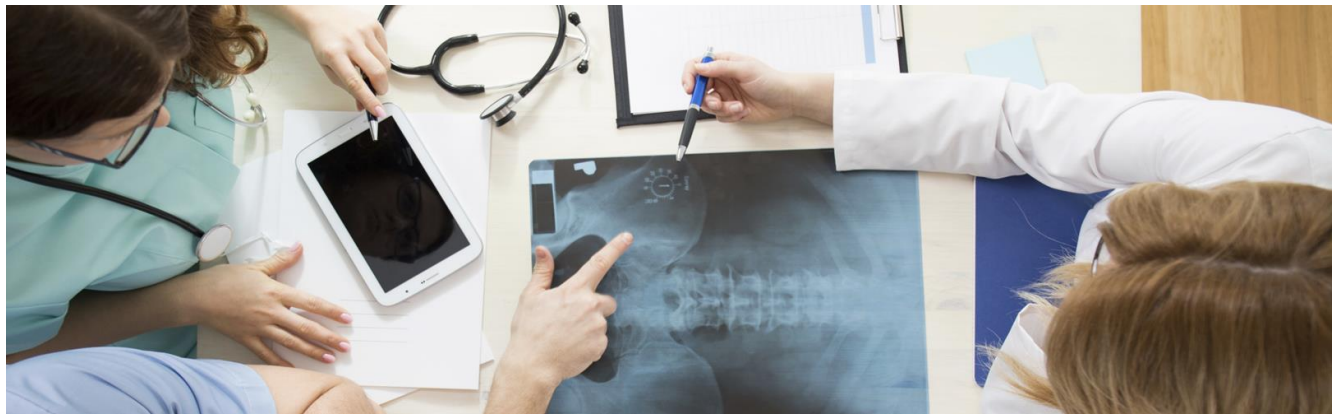
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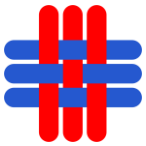




## Self-monitoring Framework Objectives

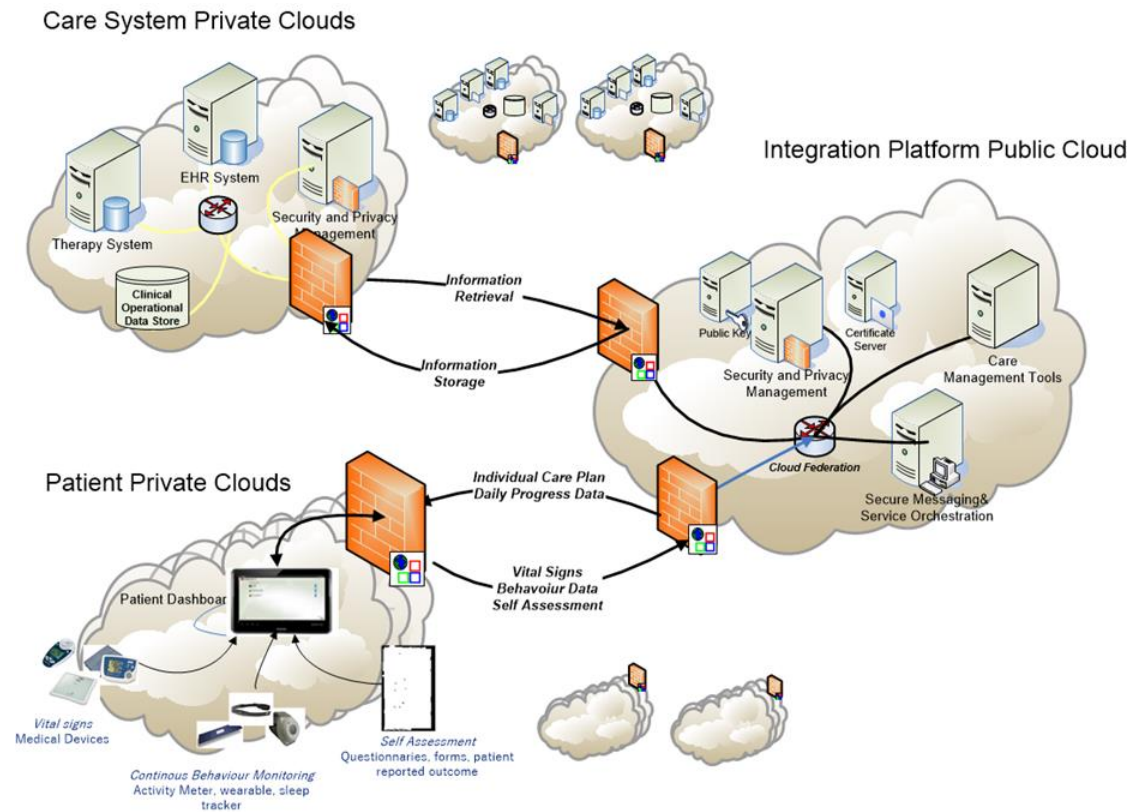
- Enable continuous patient data collection
- Support (FHIR) care-plan compliance
- Facilitate patient – clinician communication
- Promote patient empowerment, involvement and self-care
- Mobility and ease of use





# Self-monitoring components

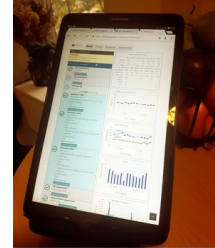
- Devices and sensors
- The PICASO measurement app
- The Patient Dashboard
- PICASO cloud platform





## Functions and use

- Executes PICASO Care Plans for interoperability
- Data capture and interaction
  - Devices (conventional and consumer)
  - Patient reported outcomes (questionnaires)
  - Activities, notifications and reminders
- Users: patients and their informal carers
  - Patients perform measurements and self assessments following scheduled activities in their care plan
  - Informal carers may access patient data from any web client, subject to authorization
- Security and Privacy
  - Secure data transfer (https) to carers clouds (clinics)
  - Pseudonymized patient IDs
  - No local storage of patient data





# Standard FHIR Care Plans for Patient Therapy Compliance

**PICASO - CLINICAL DASHBOARD**

Q Patient Selection  
Data Resource Browser  
Patient Data Viewer  
Care Plan Manager  
Communication Center  
Risk Manager

### Care plan information

CorePlan ID: 51e20f3a-bea5-5c53-f36f-1a0f4d049c3 Patient ID: 11892629 (Peter Rosengren) Author ID: ...

**Description**  
Test care plan

**Status**  
Active

**From:**  
2017-12-19

**To:**  
2019-12-19

Delete care plan Save changes in care plan

Add care plan service

Show grouped (27 services)

Medication Appointment request Health questionnaires Blood pressure measurement Step measurement Weight measurement

Medication intake - Status 'Active'  
Medication: Alendronsaure (70mg), z.B. generic Alendronsaure.  
Count per intake: 1. Total quantity: Alendronsaure (70mg), z.B. generic Alendronsaure.  
Intake: From 2018-10-02 onwards, daily, 1 time(s) per day (Before dinner). No reminders  
Author's role: Cardiologist

Medication intake - Status 'Active'  
Medication: Ketoprofen (100mg), z.B. generic Ketoprofen.  
Count per intake: 2. Total quantity: Ketoprofen (200mg), z.B. generic Ketoprofen.  
Intake: From 2018-09-05 until 2019-06-11, daily, 1 time(s) per day (Before dinner). Reminder before: 1 mins, Reminder after: 1 mins



**PICASO Start Diary Graphs Summary**

Diary - 27/09/2018

**Suspended**  
Prampexole (0.5mg), e.g. Mirapexin®  
Suspended until further notice  
Turn off auto reminders

Fill in questionnaire  
Any time  
Open FFBH/HAG

Fill in questionnaire  
Any time  
Open RADA

Steps per day  
Any time  
Walk 12000 steps per day

Medication intake  
Time of day: 08:00  
1.5 drops Brinzolamide (10mg/ml),  
p.e. Azopt  
In total: 15mg/ml  
Oral  
With a glass of water  
Confirm medication

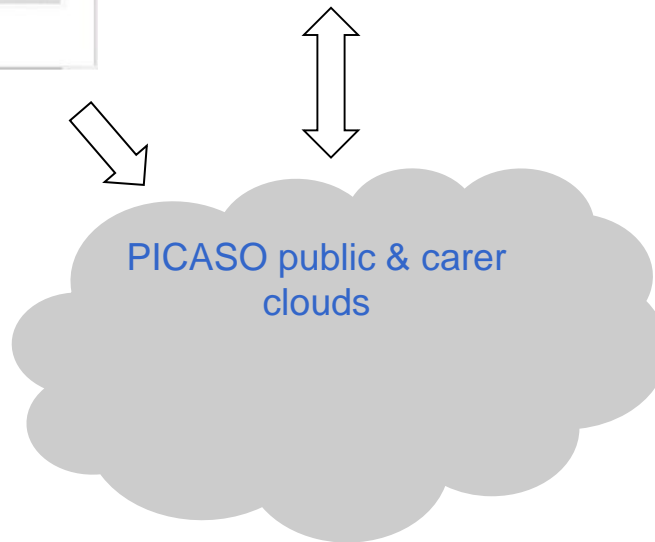
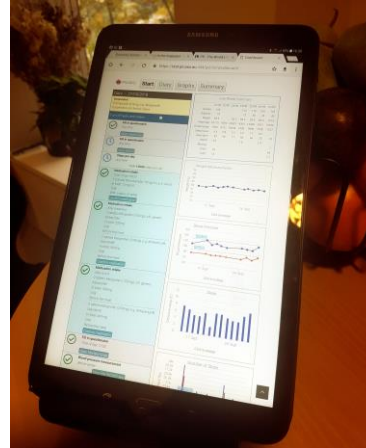
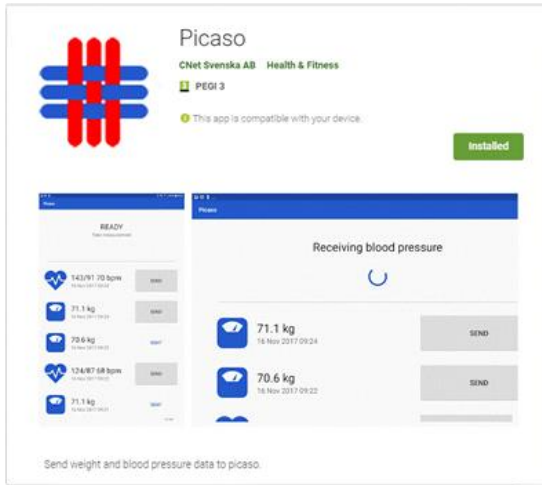
Medication intake  
After breakfast  
2 tablets Ketoprofen (100mg), z.B.  
generic Ketoprofen  
In total: 200mg  
Oral  
Before the meal  
2 tablets Ketoprofen (200mg), e.g.  
Alheumunil®, Gabliemil®  
In total: 400mg  
Oral  
Before the meal  
Confirm medication

Medication intake  
After lunch  
2 tablets Ketoprofen (100mg), z.B.  
generic Ketoprofen  
In total: 200mg  
Oral  
Before the meal  
2 tablets Ketoprofen (200mg), e.g.  
Alheumunil®, Gabliemil®  
In total: 400mg

- Basis for interoperability and data collection



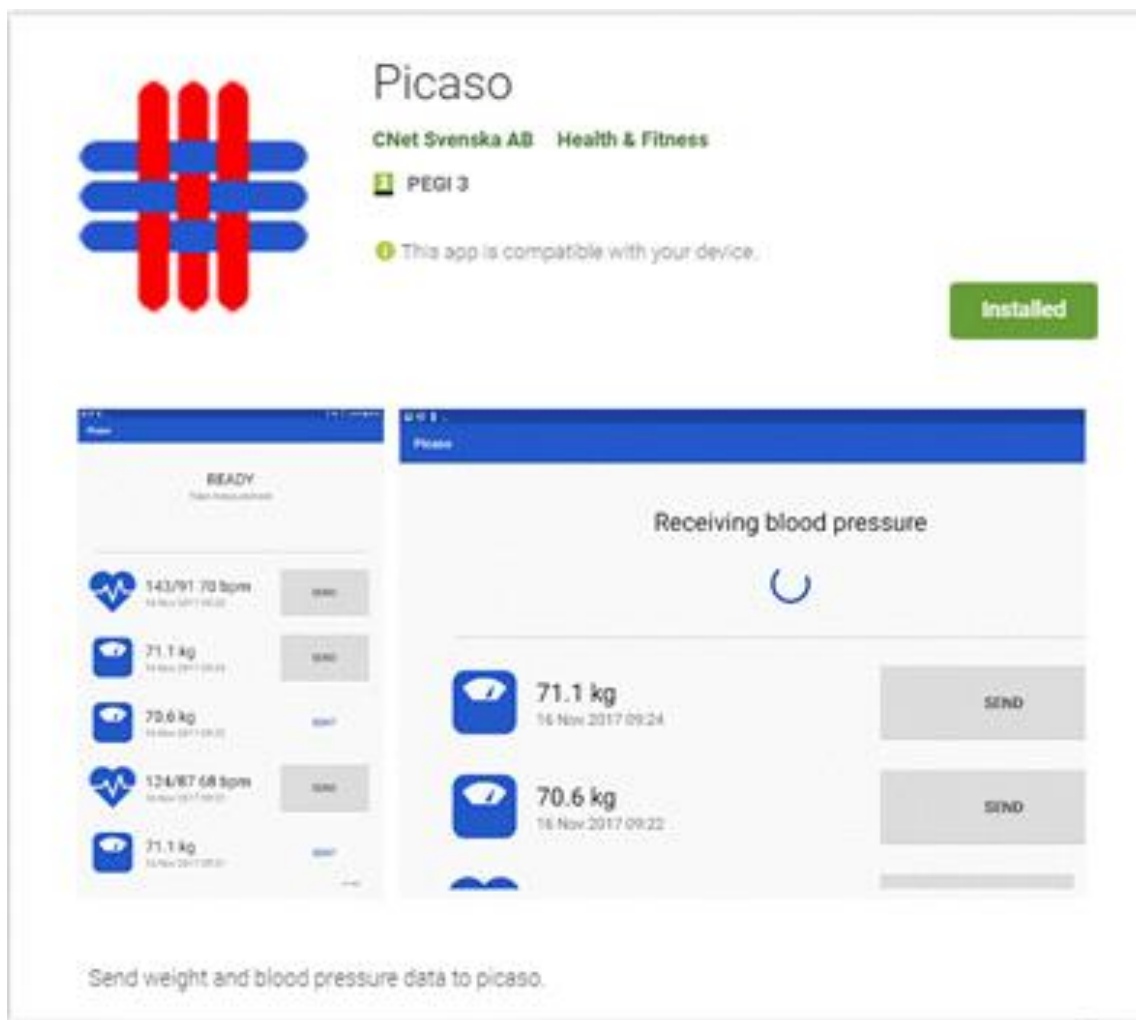
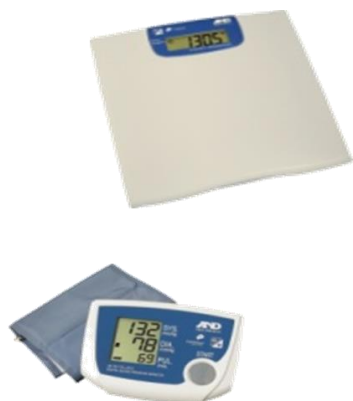
# Patient Self-Monitoring work-flow

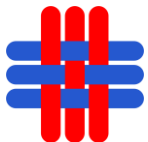




# PICASO Measurement App

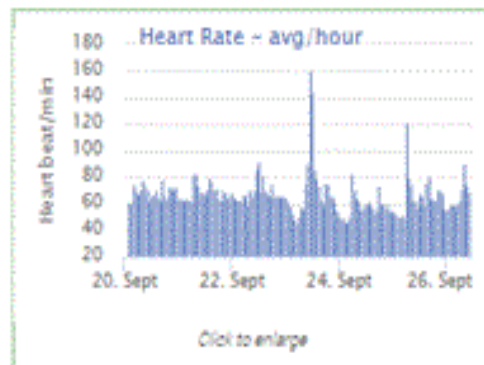
- Connects standard medical devices
- Pushes data to clinical cloud
- 6600 BPs done
- 3500 weights done





# Behaviour monitoring

- A complement to patient controlled measurements
- An activity bracelet (Fitbit) provides continuous recording of
  - sleep hours
  - walking distance and number of steps per day
    - 25 000 000 steps recorded
  - also records heart rate
- Data is automatically reported to the PICASO platform (no patient action required).



- A third party cloud service is used to relay (pseudonymised) data to the PICASO platform.





# Patient reported outcomes

- Questionnaires are used as an instrument for health status follow-up.

Questionnaire

Well-being rating

How do you feel?  
Please rate on the following scale

Very bad  Bad  OK  Good  Very good

Submit Cancel

- The HL7-FHIR Questionnaire standard structure is used to encode and communicate results.

Questionnaire

FFbH UDUS

In den folgenden Fragen geht es um Tätigkeiten aus dem täglichen Leben. Bitte beantworten Sie jede Frage so, wie es für Sie im Moment (in Bezug auf die letzten 7 Tage) zutrifft und kreuzen Sie die richtige Antwort an.

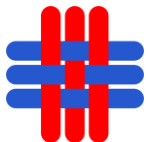
Sie haben drei Antwortmöglichkeiten:

| Ja  | Ja, aber mit Mühe   | Nein, oder nur mit fremder Hilfe  |
|---|---|---|
| Sie können die Tätigkeit ohne Schwierigkeiten ausführen | Sie haben dabei Schwierigkeiten, z.B. Schmerzen, es dauert länger als früher oder Sie müssen sich dabei abstützen | Sie können es gar nicht oder nur, wenn eine andere Person Ihnen dabei hilft |

Bitte kreuzen Sie in der folgenden Tabelle die Stärke der Schmerzen an, die Sie heute verspüren.

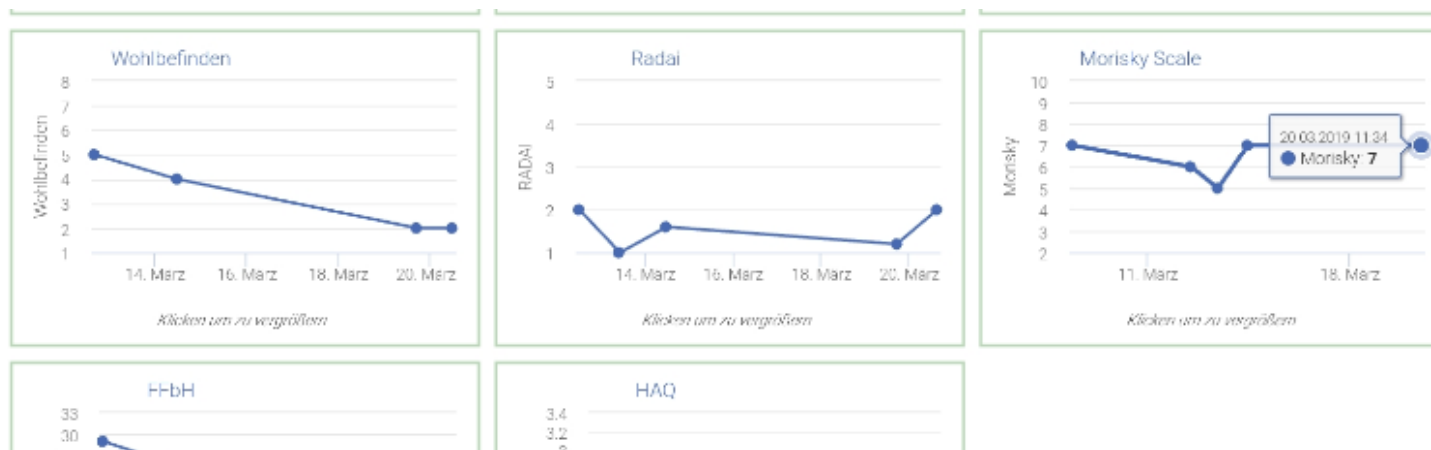
|  | Ja                    | Ja, aber mit Mühe     | Nein, oder nur mit fremder Hilfe |
|--|-----------------------|-----------------------|----------------------------------|
| 1 Können Sie Brot streichen?                   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>            |
| 2 Können Sie aus einem normal hohen Bett au... | <input type="radio"/> | <input type="radio"/> | <input type="radio"/>            |

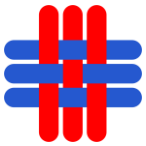
```
{
  "resourceType": "Questionnaire",
  "status": "draft",
  "date": "2019-01-24T16:33:16+01:00",
  "version": "2",
  "meta": {
    "profile": [ "http://hl7.org/fhir/us/sdc/StructureDefinition/sdc-questionnaire" ],
    "title": "Well-being rating",
    "name": "WELLB",
    "description": "Questionnaire to rate general well-being on a 5-point scale",
    "identifier": [ {
      "system": "http://www.picaso-project.eu/fhir/questionnaire",
      "value": "WELLB",
      "display": "Wellbeing"
    } ],
    "code": [ {
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      "display": "Well-being"
    } ],
    "subjectType": [ "Patient", "Person" ],
    "item": [ {
      "extension": [ {
```



## Patient reported outcomes: Form types

- Current clinical trials uses questionnaire/form types for
  - Assessment of functional capacity for RA patients (FFbH/HAQ )
  - Calculation of disease activity for RA patients (RADAI-5)
  - Medication Compliance (Morisky Scale)
  - Self-assessment of well-being
- Completed forms are stored and calculated results may be plotted in patient graphs.





## Therapy and medication compliance

- Activities are signed-off as measurements are performed
  - e.g. a weight taken
- Behaviour data reported automatically
  - sleep, steps/distance
- Medication compliance is actively reported by the patient
  - With possible deviations indicated
- The Diary scheduling system can issue reminders to patients for activities overdue (reminders can be turned off by the patient!)

Questionnaire

### Confirm medication intake

Have you taken your medication(s) in prescribed dose and foreseen intake time?

Yes  No

**Please record changes in dose taken and/or intake time and reason why.**

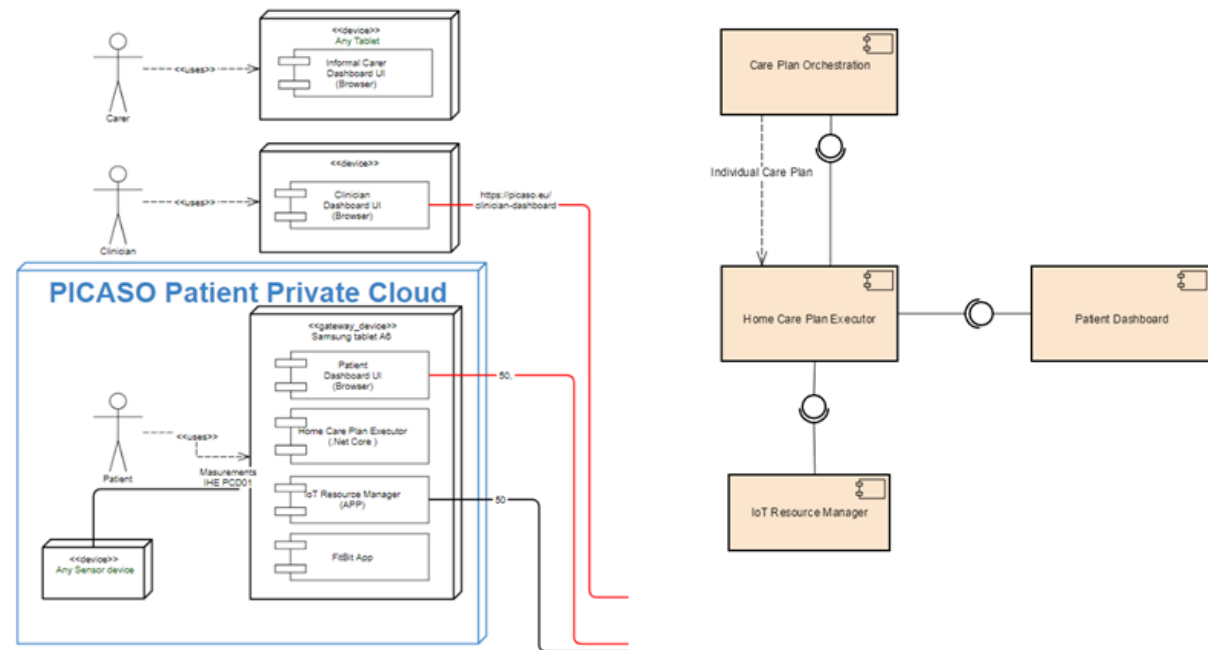
Differing dose taken: If you have taken a medication in a differing dose, change value of field accordingly. If you have not taken a medicine at all change value to 0.

| Medication   | Differing dose taken | Differing intake time | Reason               |
|--|----------------------|-----------------------|----------------------|
| 5 tablets Ketoprofen (100mg), z.B. generic Ketoprofen    | <input type="text"/> | <input type="text"/>  | <input type="text"/> |
| 2 tablets Ketoprofen (200mg), e.g. Alrheumun®, Gabrilen® | <input type="text"/> | <input type="text"/>  | <input type="text"/> |



# Technical infrastructure and API

- Public and private cloud components
- API for PICASO operational data stores (ODS)
- Third party activity (Fitbit) integration
- WordPress server-side plugin for configuration and language adaptation
- Activity logging





# Summary: Patient Self-Monitoring Framework

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- The patients and informal carers user interface for scheduled care-plan activities and compliance feedback.
- Continuous data, vital signs and behaviour monitoring.
- Patient reported outcomes through questionnaires.
- User feedback: Overview and summary of data in graphs and tables.
- Clinician feedback: aggregated patient data available over time, for controlled integration with clinical back-end systems.



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A photograph showing a group of medical professionals in a clinical setting. A doctor in a white coat is pointing at a tablet displaying an X-ray. Another person is pointing at the X-ray. A stethoscope is visible on the desk. A light blue banner with white text is overlaid on the image.

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