

# SMASCH: Facilitating multi-appointment scheduling in longitudinal clinical research studies and care programs

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## Summary and goals

- Facilitate the multi-appointment scheduling problems characteristic of longitudinal clinical research studies.
- Reduce management time, optimise clinical resources, and secure personally identifiable information.
- Satisfy recent data regulations providing features for better data accountability.
- Free and open-source solution available as Docker image, Debian and RPM packages.

# “Easy scheduling of multi-appointment longitudinal studies and integrated care programs in Luxembourg.”



Paper in JAMIA Open

## 1. Impact

A common challenge in longitudinal studies is the optimisation of appointments with different specialists to happen in a certain time interval but without being too intense for the elder participants. Reducing the number of appointments also impacts participant retention. Since 2017, SMASCH is used in the following clinical research studies and integrated care programs in Luxembourg:

- Dementia Prevention Program.
- The study for Mild Cognitive Impairment and gut microbiome (MCI-BIOME).
- The National Centre of Excellence in Research on Parkinson's disease.
- The REM sleep behavior disorder study.
- COVID-19 National survey for assessing Viral spread by Non-affected Carriers (CON-VINCE).
- ORCHESTRA. Connecting European Cohorts to increase common and effective SARS-CoV-2 Response.

## 2. Data Protection and Privacy

Longitudinal clinical studies share a common interest to safeguard sensitive information and securing personal identifiable information (PII), requiring strong data protection to ensure data privacy but at the same time the possibility to exchange pseudonymized data with scientific collaborators within the framework of the General Data Protection Regulation (GDPR) of the EU. In our deployments:

- PII and clinical data are managed by 2 separate systems.
- SMASCH secures PII and provides functionalities to track data modifications and access permissions.
- Dedicated Electronic Data Capturing (EDC) systems such as REDCap, Alchemer stores all pseudonymized clinical data.

In the light of the recent regulations, many institutions are reconsidering their use of cloud solutions and devising new policies, which may result in ruling out cloud services aimed to handle sensitive health data.

Figure: (A) Appointment calendar with the initials indicating workers availability. Colours indicate appointment types. (B) Notification menu showing different warnings and reminders. (C) List of the study participants showing information and visit status. (D) Daily planning with the participant assessments on top. Workers are sorted from left to right based on their availability. On mouse-over, the workers and participant names show a tool-tip box indicating the spoken languages to help choosing a suitable worker.

## 3. Methods and Features

SMASCH is written in Python 3, using Django web framework and licensed under the open-source license AGPLv3. The minimum requirements (1 CPU core and 2GB RAM) allow SMASCH to handle cohort sizes up to 100K participants without issues. Bigger cohorts can be handled with increased resources.

- Security: Fine grained feature permission management.
- Provenance: Logged information export for authorised personnel.
- Custom Fields: Quick adaptability, easily add new fields.
- Mail Templates: Ease output of recurring documents.
- ETL pipelines enable connecting other systems.
- Notifications: Remind missing and approaching appointments.

