Medly Activity Tracker Integration

# Introduction

To support the change in current standard of care at the Peter Munk Cardiac Clinic to now include telehealth monitoring of heart failure patients (where deemed useful or relevant by clinical staff) the Medly platform shall be updated to integrate Activity Tracker data. This new functionality will also serve to support ongoing work by research and quality improvement (QI) personnel at the Centre for Global eHealth Innovation.

# Medly Activity Tracker User Interaction Design

Update of the Medly platform to support Activity Trackers will necessitate changes and additions to the current UI/UX of the platform to support this new functionality. These design updates revolve around supporting anticipated user behavior which can roughly be grouped into 3 general requirements:

1. Provision of feedback to the users to ensure them that data is being successfully & correctly collected from patients
2. Provision of regular reminders to patients, in a manner not inconsistent with the established patient use paradigm, to ensure that patients use the activity tracker as prescribed by their clinician.
3. Although strictly outside the scope of the current update, in anticipation of upcoming changes to a Bring Your Own Device Model (BYOD), preliminary groundwork and pre-design for the provision of a means by which users can independently (without the direct assistance of Telehealth personnel) setup and connect an Activity Tracker to the Medly Application.

## Additional Requirements by User Group

### Patient Views

Shall at minimum:

Provide feedback to patient that fitness tracker is connected.

Allow for connection/authentication of fitness tracker.

Provide feedback to patient that the fitness tracker is working and collecting data.

Data visualization shall be done in

Provide method to de-authenticate fitness tracker or authenticate new fitness tracker

### Clinician Views

Shall at minimum:

Provide a means by which Activity Tracking functionality can be remotely enabled/disabled for a patient (device)

Provide feedback to clinician that fitness tracker is working

Provide feedback to clinician that fitness tracker is being worn by patient[[1]](#footnote-1)

Provide a means by which clinician can view patient heart rate data

Provide a means by which clinician can view patient activity data

Data visualization shall be done in such a manner that Clinician are able to easily & simultaneously relate heart rate and contextual ‘explainers’ of heart rate (e.g. activity data, medications, etc.)

Continue to be reasonably secured against non-authorized (see non-Clinical staff) access

Provide a means by which alerts (to be added later based on research group findings) can be displayed - (these likely to include):

Higher than expected BPM

Sustained higher than expected BPM

Sustained lower than expected activity levels (step count)

Sustained lower than expected activity levels (distance)

Patient de-authorized activity tracker (when it is ‘prescribed’/enabled for use by Clinician)

Patient not wearing activity tracker

Unable to access Activity Tracker data

### Quality Improvement/Research View

Shall at minimum:

Provide a means by which platform data can be access & downloaded including:

anonymized bulk data

analytics data (e.g. usage, interaction patterns)

Be reasonable secured against non-authorized (see non-QI/Research staff) access

## Flow Diagrams

Flow Diagrams available on Lucidchart detail the proposed design changes:

[Medly User Activity Tracker Flow](https://www.lucidchart.com/documents/edit/0e7e126e-c042-479b-a44d-2f69a4f937cc) – New Additional Flows for: User Reading Process, Trends, Setup

[Medly App Activity Tracker Flow](https://www.lucidchart.com/documents/edit/1ca2002d-9f6b-49c7-aee0-858937bf7190) – New Screens to support User Activity Tracker Flow

[Medly Patient Onboarding Flow](https://www.lucidchart.com/documents/edit/7dd2f568-4f1b-4a78-ace7-c6316d16b3b0) (with Activity Tracker) – Current Onboarding Flow, to be revised at a later date for BYOD

# Technical Background & Requirements

Activity Tracker implementation will likely differ between the iOS and Android platforms.

Current state of the art points towards the iOS Apple Healthkit as being the most solid choice for integrating Activity Tracker data from wearables into an application. It is optimized for health data, secure (and stored only on the local device) and supports a myriad of different wearable platforms, including the popular Fitbit and Apple Watch, both of which have been evaluated by the research community as generally being adequate as research grade devices compared to more expensive options[[2]](#footnote-2).

The choice for Android is not so clear. Google’s native Google Fit platform is optimized for fitness data, is stored on Google’s servers in the cloud rather than the user’s device, does not support Fitbit devices or the Apple Watch, instead focusing on Android Wear devices (amongst others) which have not seen as much evaluation and verification by the research community, and it’s terms of service explicitly disallow the use of the API for non-fitness application, e.g. the storage of medical data. Apple Watch support is simply unavailable on Android, but it is possible to use Fitbit devices through the universally accessible Fitbit REST API. Pending new developments on the Android front, the best course of action appears to be to design a system that supports the Fitbit but is extensible or at least flexible enough to be able to be expanded to support and make use of Google Fit and leverage its larger ecosystem in the future.

### References:

<https://yalantis.com/blog/how-can-healthkit-and-googlefit-help-you-develop-healthcare-and-fitness-apps/>

<https://developers.google.com/fit/overview>

## Flow Diagrams

Data Flow Diagrams for new data: [Lucid Chart Medly Activity Tracker Integration: Android Fitbit](https://www.lucidchart.com/documents/edit/78eb0d03-6576-48ae-9aaa-2cc35d20c061/0)

* Medly - Activity Tracker Authentication/Integration
* Medly - Activity Tracker Patient Access
* Medly - Activity Tracker Clinician Access
* Medly - Activity Tracker Quality Improvement/Research Access

## API Documentation

Fitbit API documentation available at: <https://dev.fitbit.com/docs/basics/>

New Fitbit Data retrieved as JSON objects

Can read/write data only through web API (not directly through device)

Must redirect to original Fitbit Authentication Page to get authentication code & token

App must be registered on Fitbit website (<https://dev.fitbit.com/apps>)

Intraday time series data only available to “personal” applications (exceptions granted on case-by-case basis through <https://dev.fitbit.com/docs/help/>)

API is rate limited (150 API requests/hr/user + 150/hr for application)

Subscription Service Available: <https://dev.fitbit.com/docs/subscriptions/#overview>

Google Fit API documentation available at: <https://developers.google.com/fit/>

## Data

This section specifies the new data that is to be collected as part of the integration. The data is roughly organized into categories and the means of access is then specified (either as manual, the device to be used or the name corresponding data type according to the Fitbit API)

Further notes:

ǂ indicates intraday values not available (only daily or as measured manually)

P indicates visible patient

C indicates visible to clinician

Q indicates visible to QI/researcher

? indicates point requires feedback from appropriate stakeholder

### Current Data:

**Weight**

manual or weight scale ǂPCQ

**Blood Pressure**

manual or BP cuff ǂPCQ

**Pulse**

manual or BP cuff ǂPCQ

**Symptoms**

manual ǂPCQ

**Test (Lab) Results**

in progress ǂPCQ

### New Fitbit Data:

**Heart Rate**

heart PCQ

**Estimated Oxygen Uptake**

This will have to calculated as one of the following: PCQ

* + Uth-Sorensen-Overgaard-Pedersen Estimation:
  + Cooper Test:
  + Rockport fitness walking test:
  + Firstbeat method: patented

**Step Count**

activities/steps PCQ?

activities/tracker/steps PCQ

**Distance Travelled**

activities/distance CQ?

activities/tracker/distance CQ

**Elevation/Flights of Stairs Travelled**

activities/floors CQ?  
activities/elevation CQ?

activities/tracker/floors CQ  
activities/tracker/elevation CQ

**Time Spent Active**

activities/minutesLightlyActive ǂCQ?  
activities/minutesFairlyActive ǂCQ?  
activities/minutesVeryActive ǂCQ?

activities/tracker/minutesLightlyActive ǂCQ?  
activities/tracker/minutesFairlyActive ǂCQ?  
activities/tracker/minutesVeryActive ǂCQ?

**Time Spent Sedentary**

activities/minutesSedentary ǂCQ?

activities/tracker/minutesSedentary ǂCQ?

**Other?**

activities/activityCalories ǂQ

activities/calories Q  
activities/caloriesBMR ǂQ

activities/tracker/activityCalories ǂQ?

activities/tracker/calories Q?  
activities/tracker/caloriesBMR ǂQ?

devices/\* Q

body/\* CQ?

profile/\* CQ?

### Detail Levels/Recording Periods Available

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Manual** | **1 sec** | **1 min** | **1 day** | **7 days** | **30 days** | **1 week** | **1 month** |
| **Current Data** |  | | | | | | | |
| Weight | ✓ |  |  |  |  |  |  |  |
| Blood Pressure | ✓ |  |  |  |  |  |  |  |
| Pulse | ✓ |  |  |  |  |  |  |  |
| Symptoms | ✓ |  |  |  |  |  |  |  |
| Test (Lab) Results | ✓ |  |  |  |  |  |  |  |
| **New Data** |  | | | | | | | |
| Heart Rate | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Estimated Oxygen Uptake | ✓ | TBD | TBD | ✓ | ✓ | ✓ | ✓ | ✓ |
| Step Count | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Distance Travelled | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Elevation/Flights Stairs Travelled | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Time Spent Active | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Time Spent Sedentary | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Other/Activities | ✓ |  |  | ✓ | ✓ | ✓ | ✓ | ✓ |
| Other/Devices | ✓ |  |  |  |  |  |  |  |
| Other/Body | ✓ |  |  |  |  |  |  |  |
| Other/Profile | ✓ |  |  |  |  |  |  |  |

1. where technically feasible [↑](#footnote-ref-1)
2. Although it should be noted that Apple Healthkit does not support Android Wear devices. However, these devices have not been thoroughly evaluated by the research community which has primarily focused on research grade devices as well as the Apple Watch & various models of Fitbit devices. [↑](#footnote-ref-2)