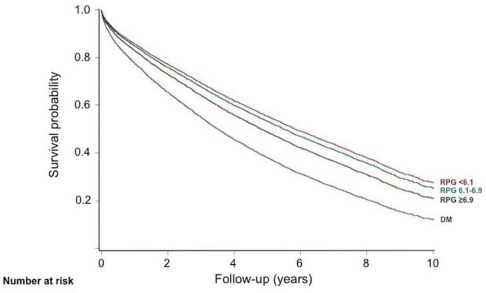
respectively (p<0.0001). Left ventricular ejection fraction did not differ across the groups, (≈22% with LVEF ≥50%; p=0.81). Age adjusted survival by RPG category compared with known DM is depicted in Figure 1. Mortality increased by increasing RPG in patients without known DM and was highest in those with known DM (log-rank p=0.0001). Known DM was associated with an increased risk of mortality vs. the lowest RPG category (<6.1 mmol/L; adjusted HR 95% CI 1.51:1.42–1.60). The highest RPG category was associated with increased mortality even among those without known DM (adjusted HR 1.17, CI 1.08–1.25 comparing ≥7.0 vs. <6.1 mmol/L). There was no increased mortality risk comparing the slightly elevated vs. lowest RPG category (6.1–6.9 vs. <6.1 mmol/L; adjusted HR 1.04:0.96–1.11).



Age adjusted survival in HF by RPG or DM

Conclusions: In patients with heart failure without previously reported DM, increased levels of RPG were associated with greater risk of long-term mortality compared with lower RPG levels. DM was as expected associated with the highest mortality risk. These findings highlight the importance of searching for previously undetected dysglycemia and DM in heart failure populations.

DIGITAL HEALTH IN CLINICAL PRACTICE

1105
Machine-learning analysis of myocardial deformation patterns to predict incident heart failure or death in the general population

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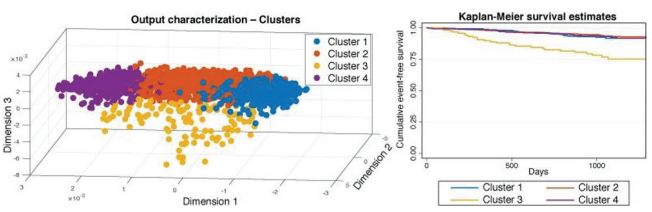
Introduction: Different measurements derived from myocardial strain data have been identified as predictors of outcome in a broad spectrum of cardiac diseases, including heart failure (HF). We hypothesize that the comprehensive analysis of entire deformation patterns, rather than scalar indices (peak, time-to-peak values) extracted from them, can be more informative in identifying subjects at a higher risk of future events.
Methods: In 1997 subjects enrolled in the Atherosclerosis Risk in Communities study (ARIC) we assessed strain patterns at 12 left ventricular locations (2 basal, 2 mid and 2 apical segments; from the 2ch and 4ch apical views) over a cardiac cycle using an unsupervised machine learning algorithm (multiple kernel learning) that positions subjects based on similarities in deformation. A K-means algorithm identified 4 clusters, for which we compared baseline characteristics and the primary outcome of death or HF event.
Results: The unsupervised analysis of deformation patterns identified 4 clinically-distinct clusters (Figure) with distinct clinical characteristics. One such cluster (Cluster 3) comprised the highest proportion of hypertensive patients (85.2%, p<0.0001) with prior myocardial infarction (3.5%, p=0.04) and atrial fibrillation (37.2%, p<0.0001); the lowest ejection fraction (61.1 (56.0–65.7) %, p<0.0001) and longitudinal strain (-12.9 (-14.4 to -11.7)%, p<0.0001); and the highest values of NT-proBNP (439 (145–1065) pg/mL, p<0.0001), left ventricular mass index (89 (73–111) g/m^2, p<0.0001) and left atrial volume index (30.3 (24.3–38.4) ml/m^2, p<0.0001). Cluster 3 was associated with a 4.1-fold increase in the risk of primary outcome (HR 4.11 (2.60–6.50), p<0.0001), which persisted after adjusting for age, sex, systolic blood pressure, prevalent coronary heart disease and prevalent atrial fibrillation (HR 2.62 (1.54–4.46), p<0.001).



Clusters and survival analysis

Conclusion: Our results serve as a proof-of-concept that unsupervised machine learning-based analysis of deformation patterns can agnostically identify subjects at a substantially higher risk of incident HF or death and confirm prior clinical knowledge.
Funding Acknowledgements: National Heart, Lung, and Blood Institute contracts (HHSN268201100005C); and the "Fundació La Marató de TV3" (no. 20154031, Barcelona, Spain)

1106
Validity of activity data collected by mobile Apple devices - Testing a new telemedical care concept for patients after hospitalization for heart failure

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Background: Due to the widespread use of mobile devices like smart watches and smart phones, "mobile health"- (mhealth-) applications open up promising possibilities of biomedical data collection and telemedical care concepts. However, sufficient evidence on data quality and the clinical benefit of these mhealth-concepts is often missing.
Purpose: This abstracts presents the results of a pilot study testing a new telemedical care concept designed for patients with newly diagnosed heart failure.The trial analysed patient acceptance and feasibility of this specific mHealth approach. To evaluate the usability of activity data collected by mobile devices, a comparison of the device-related data with those of standardized clinical examinations was performed.
Materials and methods: The tested telemonitoring platform was designed for the combination of iPhone and Apple Watch. It comprises an active part for the patient that consists of daily input of relevant clinical data (blood pressure, bodyweight, symptoms, drug intake) into the iPhone App. The App has access to health-related data as heart frequency and daily steps that are measured passively during the day. All biomedical data are transferred continuously to the doctor in charge using encrypted connections.
In the present feasibility trial, the mHealth concept was tested over a period of two months in ten study participants who were hospitalized for newly diagnosed heart failure (LVEF ≤40%, NYHA ≥ II). For the duration of study, patients were provided an iPhone 6 SE as well as a first generation Apple Watch. At study inclusion as well as after one and two months, participants underwent the following examinations: transthoracic echocardiography, NTproBNP i.s., spiroergometry, questionnaires for heart failure and anxiety, 4 days Holter ECG, 6 minute walk test (6 MWT). A device-based 6 MWT was opposed to the standard 6 MWT.
Results: In questionnaires, the app received good values for usability and patient acceptance. Over the study period, the weekly average of daily steps showed a significant increase (2880 steps/day ± 2318 at study inclusion and 6095 steps/day ± 4158 at the end of study; p<0.0001) that correlated with an improvement of conventional parameters (LVEF in TTE, NT-proBNP, spiroergometry). The walking distance of the standard 6 MWT (578 m ± 166) didn't differ significantly from that of the device-related 6 MWT (vs. 520 m ± 111), but showed a strong correlation (r=0,929; p<0,001). A head-to-head comparison of heart frequency data measured by the Apple Watch with those of Holter ECGs will be presented.
Conclusion: Our pilot study shows that the developed mhealth- concept is suitable to telemonitor patients with heart failure. Device-collected activity data showed a strong correlation with conventional diagnostic parameters. Mhealth-applications may therefore be regarded as promising tools for telemedical care concepts and possible endpoints in clinical heart failure studies.

1107
Improved healthcare cost by reducing all unnecessary hospital admissions beyond 30-day readmissions: a new clinical model using interreality care for value-based paradigm

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Background: Reduction of 30-day hospital readmissions has been challenging to all hospitals in the paradigm shift from volume-based to value-based new healthcare in the US. It is even more difficult to reduce all unnecessary hospital admissions beyond readmissions due to intensive clinical care needs outside the hospital. Although telemedicine has been proposed as a new approach to reduce hospital readmissions, the current technology and clinical support are insufficient to provide care for high risk populations.
Methods: In addition to Conventional Care (CC: hospital/clinic), an Interreality Care (IRC) service was created for patients outside of the hospital with integration of: 1. CC; 2. On-Site Care using mid-level providers and testing (vitals, labs, imaging) at patients' residency; and 3. On-Line Care using 24/7 monitoring and specialty intervention (cardiology and pulmonology). A group of 112 Medicare patients with multiple hospitalizations enrolled in the service over 16 months. The duration of each hospitalization (General wards and ICU) and costs for the hospital stays for healthcare were compared between CC and IRC.
Results: The average number of hospitalizations per patient was 4.2 in CC and

0.8 in IRC. The average healthcare cost per patient was $59,980 for CC and $11,850 for IRC. The overall net cost savings between CC and IRC was $4.9M for healthcare.

Table 1

	Conventional Care	Interreality Care
Admissions/Readmissions	270/151	37/38
Days of Hospital/ICU Stay	2,283/194	401/54
Total Cost for Healthcare	$6,058,019	$1,196,905

$p<0.0001$.

Conclusion: To our knowledge, this is the first study to test the model of reduction of both unnecessary hospital admissions and readmissions using the integration of IRC. The preliminary results demonstrated that IRC with integrated Hospital, Clinic, On-Site, and On-Line care for patients at home can improve both quality and the cost of care, not only for 30-day readmissions, but for all healthcare admissions. Further study is warranted to examine implementation and scalability of the new model in a variety of healthcare settings, such as ACO, HMO and public health worldwide.

1108
Post-ablation outcome monitoring using a pulse-deriving smartphone application

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Objectives: Despite improvements of outcome of ablation for AF, early arrhythmia recurrence is not uncommon up to 3 months post-ablation. Although these arrhythmias are transient and do not represent treatment failure, it is widely recognized as a risk factor for long-term recurrence. To date, a better understanding in the correlation between early and long-term recurrence is hindered by an inability to continuously monitor these patients. We hypothesize that the implementation of a pulse-deriving smartphone application in this population offers the potential to detect early as well as late recurrence in order to initiate proper treatment in a timely manner.
Methods: Four clinical centres included a total of 80 participants who underwent successful AF treatment using ablation therapy. All participants were instructed to measure twice daily with a pulse-deriving smartphone application and additionally when experiencing symptoms, for a monitoring period of 4 months post-ablation. The planned usual-care pathway was registered at study inclusion. All measurements were revised algorithmically and confirmed by the treating physicians and healthcare professionals from a monitoring centre. At time of inclusion and study end a 12-lead ECG was performed.
Results: The mean age of the study population was 66 (±13) years from which 25% was male. Using the CHA2DS2-VASc score, 61% of the participants had an increased stroke risk (i.e. a score of 2 or more). Overall compliance to conduct measurements was recorded at 91% with 2 measurements per day. The smartphone app was able to identify 29 AF-cases (36%) of which 27 paroxysmal and 2 persistent. Only 37% of the AF cases were symptomatic. In the usual care path only 3/29 (10%) cases were identified with 12-lead ECG at the next scheduled consult and 9 (31%) patients identified with AF would been monitored by Holter.
Conclusion: Pulse-deriving smartphone applications implemented in combination with a structured care path proved to be a promising methodology for short- and long-term outcome monitoring of post-ablation patients and are capable in the detection of silent intermittent atrial fibrillation episodes.

1109
Medication reminder apps to improve medication adherence in coronary heart disease patients (MedApp-CHD): a randomised clinical trial

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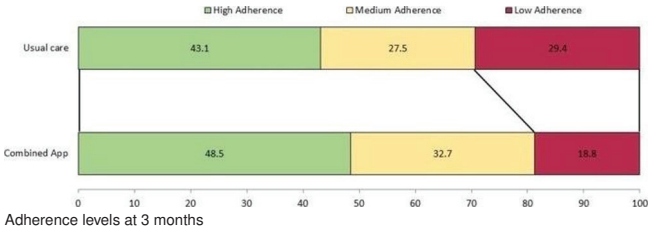
Background: Medication reminder apps have been proposed as potential tools to help reduce the global problem of medication non-adherence. However, there is a lack of evidence that these medication reminder apps are effective and it is unclear which app features influence user engagement.
Purpose: The primary aim of this study was to examine in a randomised clinical trial (RCT) the effectiveness of medication reminder apps on improving adherence to cardiovascular (CV) medication in a population with coronary heart disease (CHD). A secondary aim was to determine whether an advanced app is associated with higher adherence when compared to a basic app.
Methods: The MedApp-CHD Study was a RCT of 163 patients with CHD. All patients owned a smartphone (iOS or Android) and were recruited between May 2016 and May 2017. Patients were randomised to one of three groups: i) usual care (n=56), ii) a basic medication reminder app with no interactivity (n=54) or iii) an advanced medication reminder app with interactive and customisable features (n=53). A concealed, computerised randomisation was performed with a 1:1:1 allocation ratio. The primary outcome was the 8-item Morisky Medication Adherence Scale (MMAS-8) at 3 months. Secondary outcomes included blood pressure and cholesterol levels. The analysis of the primary outcome was performed comparing the basic and advanced apps' groups combined (combined app group) to the usual care group, using analysis of covariance with baseline values used as covariates. An additional analysis to assess whether there was a difference in adherence between the basic and advanced app groups was performed.
Results: The groups were well-matched at baseline, 88% were male, mean age was 58 (SD 8.9), mean number of CV medications was 4.2 (SD 1.02) and mean MMAS-8 score was 6.8 (SD 1.36). At 3 months, the mean MMAS-8 score was significantly greater (representing higher medication adherence) in the combined app group compared to the usual care group (mean difference 0.47, 95% CI 0.12 to 0.82, p 0.008). There was an increase of 0.29 in mean MMAS-8 score from baseline in the combined app group, while there was a decrease of 0.26 in mean MMAS-8 score in the usual care group. A comparison between the advanced and basic app groups showed no significant difference in MMAS-8 scores (mean difference -0.16, 95% CI -0.56 to 0.24, p 0.428). Figure 1 shows the proportions of patients in each level of adherence, categorised by MMAS-8 scores at 3 months. There were also no significant differences in the secondary outcomes.



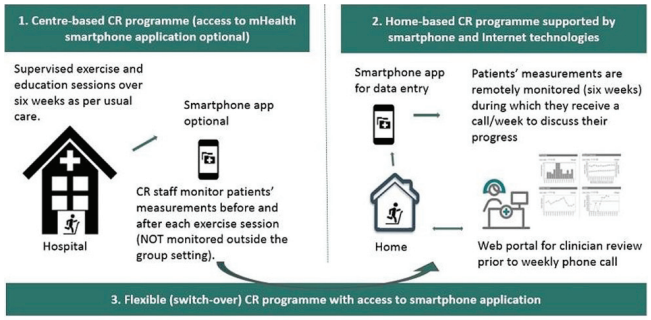
Adherence levels at 3 months

Conclusion: Medication reminder apps improved self-reported medication adherence at 3 months in patients with CHD compared to usual care. An advanced medication reminder app was not associated with higher adherence compared to a basic app, indicating that the basic and advanced apps might be equally effective. This simple and scalable intervention has the potential to reduce non-adherence to CV medications.
Funding Acknowledgements: National Heart Foundation of Australia

1110
'Real world' m-Health technology supported home-based cardiac rehabilitation - Are we there yet?

M. Varnfield, M. Gonzalez-Garcia, M. Karunanithi. *The Australian e-Health Research Centre, Brisbane, Australia*

Background: Despite proven benefits (reduced re-hospitalisation, morbidity and mortality), only 30–50% of eligible patients participate in cardiac rehabilitation (CR) programmes. Home-based CR programmes have been introduced in an attempt to widen access and participation. Similar to centre-based programmes, a number of research studies of different home-based CR models have reported improved patient outcomes. It is therefore supposed that home-based programmes can help fulfil an over-riding priority that–irrespective of gender, age, ethnicity, location, or social status–all patients can use secondary prevention services.
Purpose: A mobile health (m-Health) platform, developed to remotely deliver CR, was previously tested (through a randomised controlled trial) and demonstrated significantly better uptake and completion than, and equal clinical outcomes to that of traditional centre-based CR programmes. The current research aimed to evaluate real world implementation of this m-Health CR programme, through enabling the offering of a variety of tailored CR programme options.
Methods: Patients referred to three CR Services in Australia (Dec'16 to Oct'17) were allocated to a CR programme according to individual circumstances and choices. Centre-based, m-Health supported home-based, or hybrid programmes were offered as shown in the Figure.
Results: As at the end of recruitment, 359 eligible patients were offered CR at



Cardiac rehabilitation programme options