Getting Started with CareKit

Session 237

Umer Khan Software Engineer
CareKit Overview
ResearchKit
<table>
<thead>
<tr>
<th>Event</th>
<th>Location</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>What’s New in ResearchKit</td>
<td>Nob Hill</td>
<td>Friday 10:00AM</td>
</tr>
<tr>
<td>Building Apps with ResearchKit</td>
<td>WWDC 2015</td>
<td></td>
</tr>
</tbody>
</table>
CareKit
Overview

Open source framework
Helps providers build apps that empower patients
Focused on engaging patient to take active role in their care
Penick Medical Center General Surgery Post-Operative Discharge Instructions

MEDICATIONS:
You have been prescribed pain medication. Directly after discharge be sure to take:
- hydrocodone 5mg/acetaminophen 300mg tablet - take 1-2 tablets every 4-6 hours as needed (not to exceed 8 tablets daily). After 4 days of this pain medication, start decreasing the frequency of hydrocodone (e.g. twice a day).
- If you have breakthrough pain, try adding ibuprofen in between your hydrocodone doses.
- hydrocodone 5mg/acetaminophen 300mg and ibuprofen 400mg. By the second week, post discharge shift completely to ibuprofen 400mg every 6-8 hours as needed.

It is important to your recovery that you do not wait until your pain becomes severe before taking this medication. It may not work as well if you wait too long to take it between doses.
You may be prescribed antibiotics to help treat or prevent infection. If you need to be given antibiotics, be sure to complete the full course of antibiotics along with your prescribed pain medication. Antibiotics may be prescribed to you a few days into your recovery if risk of infection becomes clear.

ACTIVITY:
Although it might be painful, movement is a key part of your recovery starting from day 1. However, too strenuous of an activity can be detrimental to your recovery.
- For the first two days after surgery, be sure to stand up and move around for at least 2 minutes twice a day.
- After day 3, be sure to increase your activity level. At a minimum walk around for 5-10 minutes 3x per day. Activity is okay based on your comfort level, but avoid overly strenuous activity such as lifting heavy objects.

DIET:
You will need to start your recovery process on a liquid diet and then slowly add solid foods back into your diet. Depending on how your recovery is going, you may need to add more fiber to your diet, but be sure to not add too much fiber too early. You may also be told to use a lactose or stool softener, these can often be bought over the counter.
- Consume at least 4 fluid meals during your first 3 days of recovery. This can include soups, juices, and shakes.

WOUND CARE:
A soft bandage has been placed over your incision. Keep your incision clean and dry.
- Don’t touch the bandage for the first 2 days. On day 3, start changing the bandage daily to a new, dry sterile gauge. Don’t get the bandages wet for the first 2 days.
- You may shower 2-3 days after your operation. If you notice any discoloration of the wound area, call your doctor immediately.
- If steri-strips were applied to the incision, be sure to lengthen them before they fall off on their own.

Call your doctor right away if you have any of the following:
- Fever of 100.4 degrees F or higher
- Pain or tenderness near your incision area
- Increased redness, swelling, or bleeding at the incision site
- Nausea or persistent pain that isn’t relieved by pain medication
- Your range of motion isn’t improving after 7 days

Penick Medical Center
Clinic Hours: Mon/Wed/Fri 7:30-5:30, Tue/Thurs 7:30-7:30, Sat 9-12. Closed Sundays & Holidays
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It is important to your recovery that you do not wait until your pain becomes severe before taking this medication. It may not work as well if you wait too long to take it between doses. You may be prescribed antibiotics to help treat or prevent infection. If you need to be given antibiotics, be sure to complete the full course of antibiotics along with your prescribed pain medication. Antibiotics may be prescribed to you a few days into your recovery if risk of infection becomes clear.

ACTIVITY:
Although it might be painful, movement is a key part of your recovery starting from day 1. However, too strenuous of an activity can be detrimental to your recovery:
- For the first two days after surgery, be sure to stand up and move around for at least 3 minutes twice a day.
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- Consume at least 4 fluid meals during your first 3 days of recovery. This can include soups, juices and shakes.

WOUND CARE:
A soft bandage has been placed over your incision. Keep your incision clean and dry.
- Don't touch the bandage for the first 2 days. On day 3, start changing the bandage daily to a new, dry sterile gauze. Don't get the bandage wet for the first 2 days!
- You may shower 3 days after your operation. If you notice any discoloration of the wound area, call your doctor immediately.
- If suture strips were applied to the incision, do not remove, let them fall off on their own.

Call your doctor right away if you have any of the following:
- Fever of 100.4 degrees F or higher
- Pain or tenderness near your incision area
- Increased redness, swelling or bleeding at the incision site
- Nausea or persistent pain that isn't relieved by pain medication
- Your range of motion isn't improving after 7 days

Penick Medical Center
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Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Card

Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 5 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
## Symptom Tracker

**Activity Completion**
June 17, 2016

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Description</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>Lower back</td>
<td>6/10</td>
</tr>
<tr>
<td>Range of Motion</td>
<td>Arm movement</td>
<td>50°</td>
</tr>
<tr>
<td>Discoloration</td>
<td>Around surgical area</td>
<td>None</td>
</tr>
<tr>
<td>Weight</td>
<td>Bluetooth scale</td>
<td>145 lbs</td>
</tr>
</tbody>
</table>
## Weekly Insights
6/5 - 6/11

### Medication Adherence
Your ibuprofen adherence was 40% last week

<table>
<thead>
<tr>
<th>Day</th>
<th>Pain</th>
<th>Ibuprofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>M</td>
<td>5%</td>
<td>50%</td>
</tr>
<tr>
<td>T</td>
<td>40%</td>
<td>7%</td>
</tr>
<tr>
<td>W</td>
<td>9%</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>3%</td>
<td>80%</td>
</tr>
<tr>
<td>S</td>
<td>20%</td>
<td>8%</td>
</tr>
</tbody>
</table>

### Pain Score Update
Your pain score ranged between 10 to 3 in the past
CARE TEAM

Dr. Paul Cashman
Physician

Greg Apodaca
Nurse

FRIENDS & FAMILY

Kevin Frank
Father

Katie Abeles
Sister

Chance Graham
Uncle
Patient-Provider Experience
TMC Care 14m ago
Good morning, John! Please step on a scale and provide your weight for this morning.
Enter passcode

Touch ID or Enter Passcode

0 0 0 0
Weight
Measurement

ENTER WEIGHT

184 lbs

INSTRUCTIONS

Weigh yourself on a scale at a similar time every day.
Care Card

Care Completion
June 17, 2016
0%

Short Walk

Feverall

Ibuprofen
Short Walk

INSTRUCTIONS

Take a 15-20 minute walk. Light walking only. If you start feeling discomfort or pain, stop.
Assessments

Activity Completion
June 17, 2016

Frailty Test (get-up-and-go)

Surgical Site Pain

Infection

Steps
Assessments

Activity Completion
June 17, 2016

40%

Frailty Test (get-up-and-go)

Surgical Site Pain

Infection

Steps

12345
Assessments

Activity Completion
June 17, 2016

60%

Frailty Test (get-up-and-go)

Surgical Site Pain
4

Infection
Yes

Steps

181
Assessments

Activity Completion
June 17, 2016

Frailty Test (get-up-and-go) <1m>

Surgical Site Pain 4

Infection Yes

Steps 184
Frailty (Get Up & Go) Update

Your Frailty (Get Up & Go) rate this week is 15 steps per minute, which is an improvement from last week’s 0 steps per minute.

Frailty (Get Up & Go)
<table>
<thead>
<tr>
<th>CARE TEAM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dr Paul Cashman</strong></td>
<td>Physician</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FRIENDS &amp; FAMILY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change Graham</strong></td>
<td>Uncle</td>
</tr>
<tr>
<td><strong>Katie Abeles</strong></td>
<td>Sister</td>
</tr>
</tbody>
</table>
You have received a new message from Dr. Cashman.
Creating a CareKit App
CareKit Modules

Care Card
Symptom Tracker
Insights Dashboard
Connect
CareKit Modules

- Care Card
- Symptom Tracker
- Insights Dashboard
- Connect

- Care Plan Store
- Document Exporter
Care Plan Store

Activity

Event

Care Plan Store
Care Plan Store

Defining activities and events
Creating an activity and adding it to the store
The relationship between activities and events
Surfacing activities to the front-end modules
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Activity:
- Ibuprofen 200mg
- Stand and move a little: For at least 2 minutes
- Diet: Fluids only, every 6 hours
- Keep bandage dry: Do not change gauze
- Physical Therapy: Knee and back

Event:
- Care Completion: June 17, 2016
- Completion: 64%
Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little  For at least 2 minutes

Diet  Fluids only, every 6 hours

Keep bandage dry  Do not change gauze

Physical Therapy  Knee and back
Care Plan Store

Activity

- identifier
- groupIdentifier
- title
- text
- tintColor
- type
- schedule
Care Plan Store

Activity

- identifier
- groupId
- title
- text
- tintColor
- type
- schedule

ibuprofenMedication
Care Plan Store

- identifier: ibuprofenMedication
- groupIdentifier: painMedications
- title
- text
- tintColor
- type
- schedule

Activity
Care Plan Store

- identifier: ibuprofenMedication
- groupIdentifier: painMedications
- title: Ibuprofen
- text
- tintColor
- type
- schedule

Activity
Care Plan Store

Activity

- identifier: ibuprofenMedication
- groupIdentifier: painMedications
- title: Ibuprofen
- text: 200 mg
- tintColor: Blue
- type
- schedule
Care Plan Store

Activity

- ibuprofenMedication
- painMedications
- Ibuprofen
- 200 mg
- Blue

identifier
groupIdentifier
title
text
tintColor
type
schedule
Care Plan Store

Activity

- ibuprofenMedication
- painMedications
- Ibuprofen
- 200 mg
- Blue
Type

Activity

Interventions

Care Card

Care Completion June 17, 2016 64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Type
Activity

Interventions

Assessments
Care Plan Store

Activity

- identifier: ibuprofenMedication
- groupIdentifier: painMedications
- title: Ibuprofen
- text: 200 mg
- tintColor: Blue
- type: Intervention
- schedule:
Care Plan Store

<table>
<thead>
<tr>
<th>identifier</th>
<th>ibuprofenMedication</th>
</tr>
</thead>
<tbody>
<tr>
<td>groupIdentifier</td>
<td>painMedications</td>
</tr>
<tr>
<td>title</td>
<td>Ibuprofen</td>
</tr>
<tr>
<td>text</td>
<td>200 mg</td>
</tr>
<tr>
<td>tintColor</td>
<td>Blue</td>
</tr>
<tr>
<td>type</td>
<td>Intervention</td>
</tr>
<tr>
<td>schedule</td>
<td></td>
</tr>
</tbody>
</table>

Activity
Schedule
Activity
Schedule

Activity

Specify which days

• Daily
• Weekly
• Custom
Schedule
Activity

Specify which days
• Daily
• Weekly
• Custom

Times per day
• Frequency
Let’s Define a Schedule!
Let’s Define a Schedule!

Weekly Schedule

S M T W T F S
Let’s Define a Schedule!

<table>
<thead>
<tr>
<th>Weekly Schedule</th>
<th>S</th>
<th>M</th>
<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
<th>S</th>
</tr>
</thead>
</table>

Let’s Define a Schedule!

Weekly Schedule

Frequency
Let’s Define a Schedule!

Weekly Schedule

Frequency

4
2
4
Let’s Define a Schedule!
Care Plan Store

- **ibuprofenMedication**
- **painMedications**
- **Ibuprofen**
- **200 mg**
- **Blue**
- **Intervention**

Activity
Care Plan Store

Schedule

M 4
W 2
F 4
Care Plan Store

Schedule

Events
Care Plan Store

Schedule

Events

- Event: 6/20/16
- Event: 6/20/16
- Event: 6/20/16
- Event: 6/20/16
- Event: 6/22/16
- Event: 6/22/16

...
Care Plan Store

Schedule

Events

Event 6/20/16
Event 6/20/16
Event 6/20/16
Event 6/20/16
Event 6/20/16
Event 6/22/16
Event 6/22/16

...

6/20/16
6/20/16
6/20/16
6/20/16
6/20/16
6/22/16
6/22/16
Care Plan Store

Activity

Event

Care Plan Store
// Creating Care Plan Store
// Define a persistent directory url

var myCarePlanStore: OCKCarePlanStore

// Determine the file URL for the store.
let searchPaths =
NSSearchPathForDirectoriesInDomains(.applicationSupportDirectory, .userDomainMask, true)
let applicationSupportPath = searchPaths[0]
let myDirectoryURL = URL(fileURLWithPath: applicationSupportPath)

myCarePlanStore = OCKCarePlanStore(persistenceDirectoryURL: myDirectoryURL)
// Creating Care Plan Store
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myCarePlanStore = OCKCarePlanStore(persistenceDirectoryURL: myDirectoryURL)
func addIbuprofenActivity() {
    // Create a weekly schedule.
    let startDate = DateComponents(year: 2016, month: 01, day: 01)
    let schedule = OCKCareSchedule.weeklySchedule(withStartDate: startDate,
                                  occurrencesOnEachDay: [0, 4, 0, 2, 0, 4, 0])

    // Create an intervention activity. Make sure to NSLocalizedString for all strings.
    let ibuprofenActivity = OCKCarePlanActivity.intervention(withIdentifier: "ibuprofenMedication", groupIdentifier: "painMedications", title: "Ibuprofen", text: "200mg", tintColor: UIColor.blue(),
                                  instructions:"Take with food.", imageURL: NSURL.fileURL(withPath: "ibuprofen.png"),
                                  schedule: schedule, userInfo: nil)

    // Add activity to care plan store.
    myCarePlanStore.add(ibuprofenActivity, { success, error in
                                                  // Perform error checking.
                                                  ...
                                            })
}
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```swift
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        // Perform error checking.
        ...
    })
}
Care Plan Store

Encrypted data storage
Care Card
Interactive treatment plan
Care Plan Store

identifier: ibuprofenMedication

groupIdentifier: painMedications

title: Ibuprofen

text: 200 mg

tintColor: Blue

type: Intervention

schedule: M W F 4 2 4
Care Plan Store

- ibuprofenMedication
- painMedications
- Ibuprofen
- 200 mg
- Blue
- Intervention

Activity
// Creating a Care Card
// Link it to a Care Plan Store

// Create a Care Card view controller.
let viewController = OCKCareCardViewController(carePlanStore: myCarePlanStore)

// Embed the view controller in a navigation controller.
let navController = UINavigationController(rootViewController: viewController)

self.present(navController, animated: true, completion: nil)
Creating a Care Card
Link it to a Care Plan Store

Create a Care Card view controller.
```
let viewController = OCKCareCardViewController(carePlanStore: myCarePlanStore)
```

Embed the view controller in a navigation controller.
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Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Card

Care Completion
June 17, 2016
64%

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Physical Therapy Knee and back
Care Card

Care Completion
June 17, 2016
64%

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Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Ibuprofen
200mg

INSTRUCTIONS

Take with food. If you experience any side effects, discontinue immediately and contact your physician.

ADDITIONAL INFORMATION
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Updating Events

Care Card
Updating Events

Care Card

Self-reported
Updating Events

Care Card

Self-reported

Task completion
Updating Events
Care Card

Self-reported
Task completion
Device sensors via HealthKit
Care Completion
June 17, 2016
64%

Ibuprofen 200mg

Stand and move a little For at least 2 minutes

Diet Fluids only, every 6 hours

Keep bandage dry Do not change gauze

Physical Therapy Knee and back
Care Card
Interactive treatment plan
Symptom and Measurement Tracker
Subjective and objective data
Care Plan Store

Activity

- identifier
- groupIdentifier
- title
- text
- tintColor
- type
- schedule
Care Plan Store

Activity

- identifier: painAssessment
- groupIdentifier: surveys
- title: Pain
- text: Lower back
- tintColor: Blue
- type: Assessment
- schedule: M W F 2 1 2
// Create a Symptom Tracker
// Link it to a Care Plan Store

// Create a Symptom Tracker view controller.
let viewController = OCKSymptomTrackerViewController(carePlanStore: myCarePlanStore)
viewController.delegate = self

// Embed the view controller in a navigation controller.
let navController = UINavigationController(rootViewController: viewController)
// Create a Symptom Tracker
// Link it to a Care Plan Store

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// Embed the view controller in a navigation controller.
let navController = UINavigationController(rootViewController: viewController)
Symptom Tracker

Activity Completion
June 17, 2016

Pain
Lower back
6 of 10

Range of Motion
Arm movement
50 degrees

Discoloration
Around surgical area
None present

Weight
Bluetooth scale
145 lbs
Activity Completion
June 17, 2016

Pain
Lower back
6 of 10

Range of Motion
Arm movement
50 degrees

Discoloration
Around surgical area
None present

Weight
Bluetooth scale
145 lbs
Activity Completion
June 17, 2016

Pain
Lower back
6 of 10

Range of Motion
Arm movement
50 degrees

Discoloration
Around surgical area
None present

Weight
Bluetooth scale
145 lbs
Assessments

- Pain: 6/10
- Range of Motion: 50 degrees
- Discoloration: None
- Weight: 145 lbs
Assessments

Survey
Assessments

Survey

Active task
Assessments

Survey
Active task
Self-reported
Assessments

Survey
Active task
Self-reported
HealthKit / Bluetooth device
// Symptom Tracker Delegate
// Implement delegate to present assessments

func symptomTrackerViewController(_ viewController: OCKSymptomTrackerViewController,
didSelectRowWithAssessmentEvent assessmentEvent: OCKCarePlanEvent) {
    // Look up the assessment activity.
    let activity = assessmentEvent.activity
    presentViewController(for: activity)
}
func updateResult(of event: OCKCarePlanEvent) {
    // Obtain values for event.
    let painScoreValue = getPainScore()

    // Create a result object.
    let result = OCKCarePlanEventResult(valueString: painScoreValue, unitString: "of 10", userInfo: nil)

    // Update the Care Plan Store.
    myCarePlanStore.update(event, with: result, state: .completed, completion: { success, event, error in
        // Perform error checking.
        ...
    })
}

func updateResult(of event: OCKCarePlanEvent) {
    // Obtain values for event.
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    // Create a result object.
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    let painScoreValue = getPainScore()

    // Create a result object.
    let result = OCKCarePlanEventResult(valueString: painScoreValue, unitString: "of 10", userInfo: nil)

    // Update the Care Plan Store.
    myCarePlanStore.update(event, with: result, state: .completed, completion: { success, event, error in
        // Perform error checking.
        ...
    })
}
Activity Completion
June 17, 2016

Pain
Lower back 6 of 10

Range of Motion
Arm movement 50 degrees

Discoloration
Around surgical area None present

Weight
Bluetooth scale 145 lbs
Symptom and Measurement Tracker
Subjective and objective data
Insights
Understanding your data
Insights

Items
Insights

Items

Messages

• Tip
• Alert
Insights

Items

Messages
• Tip
• Alert

Charts
• Grouped bar chart
• Custom chart
Weekly Insights
6/5 - 6/11

**Medication Adherence**
Your ibuprofen adherence was 40% last week

<table>
<thead>
<tr>
<th>Pain with Ibuprofen</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S 6/5</td>
<td>10%</td>
</tr>
<tr>
<td>M</td>
<td>5%</td>
</tr>
<tr>
<td>T</td>
<td>50%</td>
</tr>
<tr>
<td>T</td>
<td>40%</td>
</tr>
<tr>
<td>W</td>
<td>20%</td>
</tr>
<tr>
<td>T</td>
<td>6%</td>
</tr>
<tr>
<td>F</td>
<td>3%</td>
</tr>
<tr>
<td>S 6/11</td>
<td>8%</td>
</tr>
</tbody>
</table>

**Pain Score Update**
Your pain score ranged between 10 to 3 in the past
Weekly Insights
6/5 - 6/11

**Medication Adherence**
Your ibuprofen adherence was 40% last week

**Pain**
with Ibuprofen

<table>
<thead>
<tr>
<th>Day</th>
<th>Pain</th>
<th>Ibuprofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10%</td>
<td>50%</td>
</tr>
<tr>
<td>M</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>T</td>
<td>40%</td>
<td>50%</td>
</tr>
<tr>
<td>W</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>T</td>
<td>20%</td>
<td>50%</td>
</tr>
<tr>
<td>F</td>
<td>3%</td>
<td>80%</td>
</tr>
<tr>
<td>S</td>
<td>20%</td>
<td>40%</td>
</tr>
</tbody>
</table>

**Pain Score Update**
Your pain score ranged between 10 to 3 in the past
func queryStoreForIbuprofenActivity() {
    // Query the Care Plan Store for Ibuprofen data.
    let startDate = DateComponents(year: 2016, month: 06, day: 05)
    let endDate = DateComponents(year: 2016, month: 06, day: 11)

    carePlanStore.enumerateEvents(of: ibuprofenActivity, startDate: startDate, endDate: endDate, handler: { event in
        if event?.state == .completed {
            // Calculate adherence
            ...
        }
    }, completion: { success, error? in
        // Perform error checking
        ...
    })
}
func queryStoreForIbuprofenActivity() {
    // Query the Care Plan Store for Ibuprofen data.
    let startDate = DateComponents(year: 2016, month: 06, day: 05)
    let endDate = DateComponents(year: 2016, month: 06, day: 11)

    carePlanStore.enumerateEvents(of: ibuprofenActivity, startDate: startDate, endDate: endDate, handler: { event in
        if event?.state == .completed {
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            ...
        }
    }, completion: { success, error? in
        // Perform error checking
        ...})
}
func queryStoreForIbuprofenActivity() {
    // Query the Care Plan Store for Ibuprofen data.
    let startDate = DateComponents(year: 2016, month: 06, day: 05)
    let endDate = DateComponents(year: 2016, month: 06, day: 11)

    carePlanStore.enumerateEvents(of: ibuprofenActivity, startDate: startDate, endDate: endDate, handler: { event in
        if event?.state == .completed {
            // Calculate adherence
            ...
        }
    }, completion: { success, error? in
        // Perform error checking
        ...
    })
}
var ibuprofenMessageItem: OCKInsightItem

func createIbuprofenMessageItem() {
    // Generate message using Care Plan Store data.
    let adherencePercentage = calculateIbuprofenAdherence()
    let message = "Your Ibuprofen adherence was \(adherencePercentage) last week."

    ibuprofenMessageItem = OCKMessageItem(title: "Medication Adherence", text: message, tintColor: UIColor.red(), messageType: .tip)
}
func createIbuprofenMessageItem() {
    // Generate message using Care Plan Store data.
    let adherencePercentage = calculateIbuprofenAdherence()
    let message = "Your Ibuprofen adherence was \(adherencePercentage) last week."

    ibuprofenMessageItem = OCKMessageItem(title: "Medication Adherence", text: message,
                                           tintColor: UIColor.red(), messageType: .tip)
}

var ibuprofenMessageItem: OCKInsightItem

func createIbuprofenMessageItem() {

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var ibuprofenMessageItem: OCKInsightItem

func createIbuprofenMessageItem() {
    // Generate message using Care Plan Store data.
    let adherencePercentage = calculateIbuprofenAdherence()
    let message = "Your Ibuprofen adherence was \(adherencePercentage) last week."

    ibuprofenMessageItem = OCKMessageItem(title: "Medication Adherence", text: message,
                                           tintColor: UIColor.red(), messageType: .tip)
}
Weekly Insights
6/5 - 6/11

Medication Adherence
Your ibuprofen adherence was 40% last week

Pain
with Ibuprofen

<table>
<thead>
<tr>
<th>Day</th>
<th>Pain</th>
<th>Ibuprofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10%</td>
<td>10</td>
</tr>
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<td>M</td>
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<td>5</td>
</tr>
<tr>
<td>T</td>
<td>40%</td>
<td>7</td>
</tr>
<tr>
<td>W</td>
<td>20%</td>
<td>9</td>
</tr>
<tr>
<td>T</td>
<td>20%</td>
<td>6</td>
</tr>
<tr>
<td>F</td>
<td>3%</td>
<td>80%</td>
</tr>
<tr>
<td>S</td>
<td>20%</td>
<td>8</td>
</tr>
</tbody>
</table>

Pain Score Update
Your pain score ranged between 10 to 3 in the past
```swift
var barChartItem: OCKInsightItem

func createBarChartItem() {
    let painSeries = OCKBarSeries(title: "Pain", values: [10, 5, 7, 9, 6, 3, 8],
                                valueLabels: ["10", "5", "7", "9", "6", "3", "8"],
                                tintColor: UIColor.blue())

    let ibuprofenSeries = OCKBarSeries(title: "Ibuprofen", values: [1, 5, 4, 2, 5, 8, 2],
                                        valueLabels: ["10%", "50%", "40%", "20%", "50%", "80%", "20%"],
                                        tintColor: UIColor.blue().withAlphaComponent(0.75))

    barChartItem = OCKBarChart(title: "Pain", text: "with Ibuprofen", tintColor: UIColor.blue(),
                               axisSubtitles: ["6/5", "", "", "", "", "", "6/11"],
                               dataSeries: [painSeries, ibuprofenSeries],
                               minimumScaleRangeValue: 0, maximumScaleRangeValue: 10)
}
```
var barChartItem: OCKInsightItem

func createBarChartItem() {
    let painSeries = OCKBarSeries(title: "Pain", values: [10, 5, 7, 9, 6, 3, 8],
                                valueLabels: ["10", "5", "7", "9", "6", "3", "8"],
                                tintColor: UIColor.blue())

    let ibuprofenSeries = OCKBarSeries(title: "Ibuprofen", values: [1, 5, 4, 2, 5, 8, 2],
                                       valueLabels: ["10%", "50%", "40%", "20%", "50%", "80%", "20%"],
                                       tintColor: UIColor.blue().withAlphaComponent(0.75))

    barChartItem = OCKBarChart(title: "Pain", text: "with Ibuprofen", tintColor: UIColor.blue(),
                                axisSubtitles: ["6/5", "", "", "", "", "", "6/11"],
                                dataSeries: [painSeries, ibuprofenSeries],
                                minimumScaleRangeValue: 0, maximumScaleRangeValue: 10)
}
var barChartItem: OCKInsightItem

func createBarChartItem() {

    let painSeries = OCKBarSeries(title: "Pain", values: [10, 5, 7, 9, 6, 3, 8],
        valueLabels: ["10", "5", "7", "9", "6", "3", "8"], tintColor: UIColor.blue())

    let ibuprofenSeries = OCKBarSeries(title: "Ibuprofen", values: [1, 5, 4, 2, 5, 8, 2],
        valueLabels: ["10%", "50%", "40%", "20%", "50%", "80%", "20%"], tintColor: UIColor.blue().withAlphaComponent(0.75))

}

var barChartItem: OCKInsightItem

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valueLabels: ["10", "5", "7", "9", "6", "3", "8"], tintColor: UIColor.blue())

    let ibuprofenSeries = OCKBarSeries(title: "Ibuprofen", values: [1, 5, 4, 2, 5, 8, 2],
valueLabels: ["10\%", "50\%", "40\%", "20\%", "50\%", "80\%", "20\%"], tintColor: UIColor.blue().withAlphaComponent(0.75))

minimumScaleRangeValue: 0, maximumScaleRangeValue: 10)
}
var barChartItem: OCKInsightItem

func createBarChartItem() {
    let painSeries = OCKBarSeries(title: "Pain", values: [10, 5, 7, 9, 6, 3, 8], valueLabels: ["10", "5", "7", "9", "6", "3", "8"], tintColor: UIColor.blue())

    let ibuprofenSeries = OCKBarSeries(title: "Ibuprofen", values: [1, 5, 4, 2, 5, 8, 2], valueLabels: ["10\%, "50\%, "40\%, "20\%, "50\%, "80\%, "20\%", tintColor: UIColor.blue().withAlphaComponent(0.75))

}
// Creating an Insights Dashboard
// Provide an array of insight items

// Create an Insights view controller.
let viewController = OCKInsightsViewController(insightItems: [ibuprofenMessageItem, barChartItem], headerTitle: "Weekly Insights", headerSubtitle: "6/5 – 6/11")
Weekly Insights
6/5 - 6/11

Medication Adherence
Your ibuprofen adherence was 40% last week

Pain
with Ibuprofen

<table>
<thead>
<tr>
<th>Day</th>
<th>Pain</th>
<th>Ibuprofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6/5</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>T</td>
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<td>40%</td>
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<td>W</td>
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<td>20%</td>
</tr>
<tr>
<td>T</td>
<td>6</td>
<td>50%</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>80%</td>
</tr>
<tr>
<td>S</td>
<td>8</td>
<td>20%</td>
</tr>
</tbody>
</table>

Pain Score Update
Your pain score ranged between 10 to 3 in the past
Insights
Understanding your data
Connect
Communicate and share
Connect
Contacts
Connect

Contacts

Care Team

• Physician
• Nurse
Connect

Contacts

Care Team
  • Physician
  • Nurse

Personal
  • Friend
  • Family
var physicianContact: OCKContact

func createPhysicianContact() {
    physicianContact = OCKContact(contactType: .careTeam, name: "Dr. Paul Cashman",
    relation: "Physician", tintColor: UIColor.blue(), phoneNumber:
    CNPhoneNumber(stringValue: "361-555-0111"), messageNumber: CNPhoneNumber(stringValue:
    "361-555-0121"), emailAddress: "paulcash1@icloud.com", monogram: "PC", image:
    UIImage(named: "doctor"))
}
```swift
var physicianContact: OCKContact

func createPhysicianContact() {
    physicianContact = OCKContact(contactType: .careTeam, name: "Dr. Paul Cashman",
    relation: "Physician", tintColor: UIColor.blue(), phoneNumber:
    CNPhoneNumber(stringValue: "361-555-0111"), messageNumber: CNPhoneNumber(stringValue:
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func createPhysicianContact() {
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}
Creating a Connect View Controller

Provide an array of contacts

```swift
let viewController = OCKConnectViewController(contacts: [physicianContact, nurseContact, fatherContact, sisterContact, uncleContact])
viewController.delegate = self
```

Embed the view controller in a navigation controller.

```swift
let navController = UINavigationController(rootViewController: viewController)
```
// Creating a Connect View Controller
// Provide an array of contacts

let viewController = OCKConnectViewController(contacts: [physicianContact, nurseContact, fatherContact, sisterContact, uncleContact])
viewController.delegate = self

// Embed the view controller in a navigation controller.
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// Provide an array of contacts

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viewController.delegate = self

// Embed the view controller in a navigation controller.
let navController = UINavigationController(rootViewController: viewController)
CARE TEAM

Dr. Paul Cashman
Physician

Greg Apodaca
Nurse

FRIENDS & FAMILY

Kevin Frank
Father

Katie Abeles
Sister

Chance Graham
Uncle
# Dr. Paul Cashman
**Physician**

<table>
<thead>
<tr>
<th>Contact Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phone</strong></td>
<td>361-555-0111</td>
</tr>
<tr>
<td><strong>Text</strong></td>
<td>361-555-0121</td>
</tr>
<tr>
<td><strong>Email</strong></td>
<td><a href="mailto:paulcash1@icloud.com">paulcash1@icloud.com</a></td>
</tr>
</tbody>
</table>

**Sharing**

**Send reports**
Dr. Paul Cashman
Physician

CONTACT INFO

phone
361-555-0111

text
361-555-0121

email
paulcash1@icloud.com

Send reports
### Contact Info

**Dr. Paul Cashman**  
Physician

<table>
<thead>
<tr>
<th>Type</th>
<th>Information</th>
</tr>
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<tbody>
<tr>
<td>Phone</td>
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</tr>
</tbody>
</table>

### Sharing

Send reports
// Connect Delegate
// Implement the delegate to enable sharing

func connectViewController(_ connectViewController: OCKConnectViewController,
didSelectShareButtonFor contact: OCKContact, presentationSourceView sourceView: UIView) {
    generatePDFReport()
    sharePDFReport()
}

// Connect Delegate
// Implement the delegate to enable sharing

```swift
func connectViewController(_ connectViewController: OCKConnectViewController,
didSelectShareButtonFor contact: OCKContact, presentationSourceView sourceView: UIView) {
    generatePDFReport()
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// Connect Delegate
// Implement the delegate to enable sharing

func connectViewController(_ connectViewController: OCKConnectViewController,
didSelectShareButtonFor contact: OCKContact, presentationSourceView sourceView: UIView) {
    generatePDFReport()
    sharePDFReport()
}
Connect
Communicate and share
Document Exporter

Elements

Headers and footers
Document Exporter

Elements

Headers and footers
Texts and paragraphs
Document Exporter

Elements

Headers and footers
Texts and paragraphs
Images
Document Exporter

Elements

Headers and footers
Texts and paragraphs
Images
Charts
Document Exporter

Elements

Headers and footers
Texts and paragraphs
Images
Charts
Tables
John Appleseed

In the past week, John Appleseed’s overall weekly adherence was 88%. His medication adherence was 40%. There were several incomplete dosages. The chart below shows the comparison of John’s medication adherence and pain scores.

John’s pain score saw a 6 point change in the past week. At the starting of the week, he reported a pain score of 9. On Friday, he reported a pain score of 3. The table below shows the reported pain scores for the past week, along with other symptoms and measurements reported by John.

<table>
<thead>
<tr>
<th></th>
<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Weight</td>
<td>145.8</td>
<td>145.8</td>
<td>145.8</td>
<td>144.7</td>
<td>145.2</td>
<td>145.3</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>98.1</td>
<td>99.3</td>
<td>98.7</td>
<td>99.1</td>
<td>98.9</td>
<td>99.2</td>
<td>98.5</td>
</tr>
<tr>
<td>Tapping</td>
<td>14</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>21</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

His temperature has been consistent, and tapping tests show increased tapping accuracy.
func createPDF() {
  let paragraph = OCKDocumentElementParagraph(content: "In the past week, John Appleseed’s overall weekly adherence was 86%. His medication adherence was 40%. There were several incomplete dosages. The chart below shows the comparison of John’s medication adherence and pain scores.")

  let chart = OCKDocumentElementChart(chart: barChartItem)

  let document = OCKDocument(title: "John Appleseed", elements: [paragraph, chart, table])

  let pdfURL = persistenceDirectoryURL.appendingPathComponent("CareKit.pdf")

  document.createPDFData(completion: { data, error in
    try! data.write(to: pdfURL, options: NSData.WritingOptions.atomicWrite)
  })
}
func createPDF() {
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    let chart = OCKDocumentElementChart(chart: barChartItem)

    let table = OCKDocumentElementTable(headers: ["", "Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"], rows: [['Pain', 10, 5, 7, 9, 6, 3, 8]])

    let document = OCKDocument(title: "John Appleseed", elements: [paragraph, chart, table])

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    document.createPDFData(completion: { data, error in
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<th>Sun</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
<th>Sat</th>
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</thead>
<tbody>
<tr>
<td>Pain</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>4</td>
<td>3</td>
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<tr>
<td>Weight</td>
<td>145.8</td>
<td>145.6</td>
<td>145.8</td>
<td>145.8</td>
<td>144.7</td>
<td>145.2</td>
<td>145.3</td>
</tr>
<tr>
<td>Temperature</td>
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<td>99.3</td>
<td>98.7</td>
<td>99.1</td>
<td>98.9</td>
<td>99.2</td>
<td>98.5</td>
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<tr>
<td>Tapping</td>
<td>14</td>
<td>18</td>
<td>18</td>
<td>20</td>
<td>20</td>
<td>21</td>
<td>23</td>
</tr>
</tbody>
</table>

His temperature has been consistent, and tapping tests show increased tapping accuracy.
In the past week, John Appleseed's overall weekly adherence was 86%. His medication adherence was 40%. There were several incomplete dosages. The chart below shows the comparison of John's medication adherence and pain scores.

Pain Scores with Medication Adherence

AirDrop. Tap to turn on Wi-Fi and Bluetooth to share with AirDrop.
CareKit Modules

Document Exporter
CareKit Modules

- Care Card
- Symptom Tracker
- Insights Dashboard
- Connect
- Care Plan Store
- Document Exporter
Customizing with CareKit
Care Completion
June 17, 2016
78%

Knee to Chest-bilateral

Piriformis Stretch Supine

Hamstring Stretch, Supine v2

Hip Extension, Prone v2
Hip Extension, Prone v2

3 Times Daily
1 Set 5 Reps 3 Seconds 2 Seconds Rest

Lying on your stomach, lift one leg into the air keeping the knee straight. Both hips should stay on the mat. Lower leg down slowly.
Care Completion
June 3, 2016
89%

Knee to Chest-bilateral

Piriformis Stretch Supine

Hamstring Stretch, Supine v2

Hip Extension, Prone v2
What’s Next?
What’s Next?
What’s Next?

Patient App
What’s Next?

Provider Cloud

Patient App
What’s Next?

Provider Cloud

Patient App

Care Team
Open Source
Open Source

It will become what YOU make of it!
Please Contribute!!
Please Contribute!!

github.com/carekit-apple/carekit
Collaboration

Your role
Collaboration

Your role

Issues on GitHub
Collaboration

Your role

Issues on GitHub

Develop the feature
Collaboration

Your role

Issues on GitHub
Develop the feature
Review process
Collaboration
Our role
Collaboration

Our role

Accessibility
Collaboration

Our role

Accessibility

Localization
Collaboration

Our role

Accessibility

Localization

QA testing
Collaboration

Our role

Accessibility

Localization

QA testing

Merge into framework
More Information

## Related Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Location</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting the Most Out of HealthKit</td>
<td>Nob Hill</td>
<td>Wednesday 9:00AM</td>
</tr>
<tr>
<td>What’s New in ResearchKit</td>
<td>Nob Hill</td>
<td>Friday 10:00AM</td>
</tr>
</tbody>
</table>
Labs

ResearchKit and CareKit Lab

Fort Mason

Friday 3:30PM