

Background

Hepatitis C and Adherence

- Hepatitis C virus (HCV) is the most common chronic blood-borne infectious disease in the United States.
 - The Centers for Disease Control and Prevention estimated that 17,000 Americans were newly infected in 2010 with 2.7–3.9 million persons living with a chronic HCV infection.¹
- Prior to 2011, the only approved treatment for chronic hepatitis C (CHC) was pegylated interferon (PEG-IFN) administered once-weekly subcutaneously with twice-daily oral ribavirin for 24-48 weeks.
 - Although the advent of triple-therapy has resulted in doubling the rate of Sustained Viral Response (SVR)^{2,3}, using direct-acting antiviral (DAA), first generation HCV protease inhibitors (PIs) has led to several disadvantages including frequent dosing, large pill burden, poor tolerability, high cost, food requirement, and significant drug interaction potential.⁴
 - Newly approved and investigational DAAs may overcome many of the disadvantages of first generation PIs; however, patient adherence to treatment regimens will remain a major factor in establishing SVR.
- Adherence is important for successful treatment of CHC but has not been well studied in real world settings.⁵
 - Non-adherence can lead to poor intermediate outcomes including poor early viral response, SVR, and histological changes, drug resistance, virologic relapse, morbidity, mortality, poor quality of life, and transmission of HCV.⁶
 - HCV patient adherence varies widely across studies with different designs and ways to measure adherence, including Medication Event Management System (MEMS)⁷, electronic dosing diaries⁸, insurance claims⁹, and patient self-report.¹⁰

CleverCap™

- The CleverCap™ is a novel device that aims to provide a risk management solution in conjunction with clinical trials for improved medication adherence.
 - The device addresses four core requirements of risk management, including:
 - Tracking risk indications
 - Controlling for individual dosages
 - Communicating real-time information
 - Reporting on utilization patterns
- The CleverCap™ triggers sound and visual notifications that remind the patient to take his/her medication.
- The device is equipped with sensors that provide the date and time stamp of when each dose was taken, and the information is wirelessly transmitted in real-time to a database.
 - This functionality aids in determining and assessing a patient's adherence and enables real-time treatment interventions such as phone call or text messaging reminders.

Objectives

- Primary Objective**
 - Determine if the use of the CleverCap™ along with healthcare provider support impacts CHC patients' adherence rates
- Secondary Objectives**
 - Assess virologic, serologic, and histologic changes
 - Assess adherence rates to PEG-IFN therapy
 - Assess patient quality of life reported outcomes

Methods

- Study Design**
 - Prospective, randomized, interventional study
 - Enrolled CHC patients will be randomized to group A or group B consisting of two phases each of 6 weeks duration for a total of 12 weeks
 - The CleverCap™ will record and transmit real-time data to the investigator for adherence assessment
 - Patients on PEG-IFN therapy will self-report adherence via survey questionnaires
- Participant Pool**
 - CHC patients receiving care at Jersey Shore Medical Center

Methods (continued)

Figure 1. Study Design

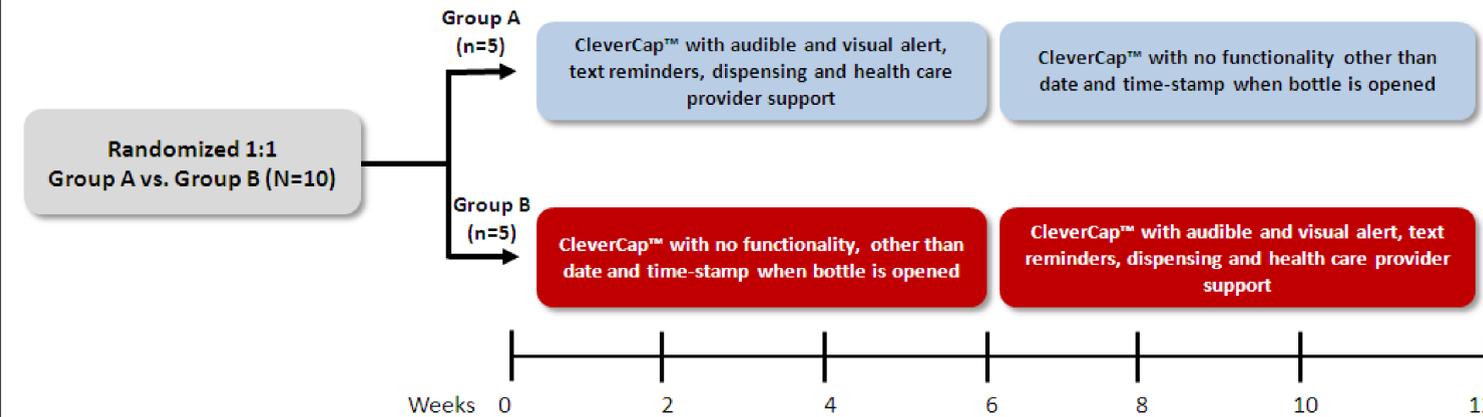


Figure 2. CleverCap™ Capabilities



Figure 3. Patient Assessments

Data Collection	Time Point Collected
Baseline Assessment	Enrollment
Quality of Life Questionnaire	Enrollment and Completion
General Adherence Questionnaire	Enrollment and Completion
Self-reported Adherence to PEG-IFN	Duration of Study Participation
Patient CleverCap™ Satisfaction Survey	Completion

Methods (continued)

- CleverCap™**
 - A microcomputer device that attaches and locks to a standard 30 or 60 dram vial and dispenses proper programmed doses
 - Provides point-of-care clinical decision support by providing physicians, investigators, pharmacy staff and extended clinical team members with real-time information on patients' medication habits and behavior
- Inclusion Criteria**
 - Age ≥ 18 years old
 - Able to demonstrate proper use of CleverCap™
 - Naïve or treatment-experienced CHC patients
 - Ability to comply with study procedures for the entire length of study
- Exclusion Criteria**
 - Age < 18 years old
 - Unable to demonstrate proper use of CleverCap™
- Statistical Analysis**
 - Adherence rates in CHC patients will be measured by electronic device and self-report.
 - The CleverScore will be calculated and differences among scores both between and within groups will be assessed with repeated measures analysis of variance.
 - Safety and tolerability of current CHC regimens in naïve and experienced patients will be assessed by patient self-report and scored by quality-of-life questionnaire.
 - A P-value of 0.05 or less will be considered an indication of statistical significance. The 95% confidence interval on the outcomes of interest will be calculated.
 - All analysis will follow intention-to-treat principles.
 - Statistical analysis will be performed using the R language (R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org/>).

Discussion

- Many studies have been performed to measure adherence rates and the correlation between poor adherence and poor clinical outcomes is apparent. However, many common measures of adherence such as patient reported surveys, pill counts, and refill records may often be inaccurate.
- The CleverCap™ is a novel device that aims to provide a risk management solution in conjunction with clinical trials for improved medication adherence. The device provides a unique opportunity to implement real-time health care provider interventions and support to increase adherence and quality of life outcomes.
- Conducting this research will determine if electronic device interventions and healthcare provider support influence adherence rates that may impact patients' quality of life.
- Information gained will be presented at Meridian Health Research Day, local and national meetings. and by publication of a manuscript.

References

- Centers for Disease Control and Prevention. Viral Hepatitis Surveillance - United States, 2011.
- Poordad F et al. *N Engl J Med.* 2011;364:1195–206.
- Jacobson IM et al. *N Engl J Med.* 2011;364:2405–16.
- Kliser JJ et al. *Annu Rev Pharmacol Toxicol.* 2013;53:427-49.
- Marcellin P et al. *Liver Int.* 2011; 31(4):516-24.
- Sun X et al. Publication No. 13-EHC009-EF. AHRQ 2012.
- Evon DM et al. *J Viral Hepat.* 2013;20(8):536-49.
- Smith SR et al. *Ann Pharmacother.* 2007;41(7):1116-23.
- Gordon SC et al. *Aliment Pharmacol Ther.* 2013;38(1):16-27.
- Mitra D et al. *Value Health.* 2010;13(4):479-86.

Author Contact Information

Please send any correspondence to:
Kimberly Kaminski
kkaminski817@gmail.com

Disclosure

The authors have nothing to disclose.