

**DEVICE MANUFACTURER AND DATA MANAGEMENT EXPERTS INTERVIEW GUIDE**  
**Mobile Devices in Clinical Research: Scientific and Technological Considerations and Challenges**  
**(Phase II)**

1. Interviewer Name	
2. Participant ID#	
3. Interview Date (dd/mm/yyyy)	_ _ _ / _ _ _ / _ _ _ _ _
4. Participant agrees for interview to be audio recorded	Yes..... <input type="checkbox"/> No..... <input type="checkbox"/>
5. Time Interview Began (hhmm-24hr clock)	_ _ _ _ _
6. Time Interview Ended (hhmm-24hr clock)	_ _ _ _ _

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- Step 8:** Ask if the participant is interested in being re-contacted to receive a summary of the study results; if yes, document appropriate contact information for follow-up (Appendix F).
- Step 9:** Ask if the participant is interested in being re-contacted about CTTI's future Mobile Clinical Trials research and project activities (Appendix F).

## Section A. Introduction

- Hello, thank you for taking time out of your busy schedule to speak with me today. My name is [Name], and I am a \_\_\_\_\_ with the Clinical Trials Transformation Initiative. Is now still a good time to talk?
- As you are well aware, the use of mobile devices within clinical research is rapidly growing. Yet, their use within phase 3 clinical trials, and particularly FDA-regulated trials, has not yet reached its full potential. This may be due in part to concerns among research sponsors and investigators about the multitude of scientific and technological considerations and challenges that should be addressed and overcome before mobile devices can be successfully used in clinical trials.
- The Clinical Trials Transformation Initiative – referred to as CTTI – is developing evidence-based recommendations to address this issue. We are interested in hearing your thoughts on how technological challenges in using mobile devices for data capture in FDA-regulated drug trials can be addressed and overcome.
- As you may know, in the US, clinical trial sponsors seeking FDA approval for a new therapeutic drug or medical device should abide by specific regulations. If data are collected from an electronic source, such as smartphone applications and wearable biosensors, the sponsor should ensure that procedures and processes are in place to safeguard the authenticity, integrity, and, when appropriate, the confidentiality of electronic records.
- I would like to know how you think your specific technology or technologies may be able to help sponsors fulfill these requirements.
- To be clear, as we discuss “mobile devices” throughout this interview, we are referring to mobile applications and remote sensor devices, including both consumer and medical grade devices, that are used for outcome data capture in clinical trials.
- Also, for the purpose of this interview, we will define the use of these mobile devices in clinical trials as the use of mobile technology to collect objective or patient-reported data during a clinical trial. We are not focused on the use of mobile devices for recruitment, retention and informed consent.
- There are no right or wrong answers to the questions I will ask, only opinions. Please feel free to share your candid thoughts to the questions that I ask you.
- As described in the informational sheet provided to you earlier, participating in this interview is voluntary. You can choose not to answer a question or you can stop participating at any time. We do not think there will be any personal risks or benefits from the interview today. However, there is a risk of loss of confidentiality. This means that people outside the study team could learn what you said in the interview. But we think this is unlikely because we do many things to protect the information you tell us such as storing your data on secure servers.

- If you agree, I would like to audio record the interview because I want to make sure I don't miss any of your comments. If you don't want the interview audio recorded, I will take detailed notes during the interview instead.
- The interview will take roughly 1 hour. Information about who to contact if you have questions about the study, including the Duke IRB, can be found in the informational sheet.
- Do you have any questions for me so far about the interview?

***[If yes, answer the participant's questions then proceed with the interview.]***

***[If no, proceed with the interview.]***

Is it okay if I turn on the audio recorder now?

***[If yes, begin audio recording now.]***

***[If no]*** That's okay, I'll take detailed notes as we talk.

Ok, let's get started!

## **Section B. Background**

1. Briefly, please describe your role in your company.
  - a. Are you involved in any of the following activities at your company:
    - The design, programming, or testing of mobile technologies. ***[Interviewer: Focus on collecting information from Sections C, D and E]***
    - The management of data flow, including data transfer, storage or archiving of data collected by mobile technologies. ***[Interviewer: Focus on collecting information from Sections E, F and G]***
2. Is your company involved in the development of mobile technology used in clinical research?
 

***[Probe if yes]***

  - a. What form of mobile technology does your company develop that has been or may be used in clinical research?
  - b. How are you involved in the development of the technology?
3. Have you or your company ever worked in partnership with clinical researchers before?
  - a. ***[If yes]*** How were you or your company involved in the research?
4. Are you familiar with the FDA regulations governing clinical research?
  - a. ***[If yes]*** What can you tell me about them?
  - b. ***[If no]*** Don't worry about it, we will briefly summarize some of the issues sponsors are interested in knowing from technology manufacturers.

### Section C. Analytical validation

To begin, I would like to talk to you about how your company ensures the technology you develop is validated. Sponsors should use mobile technology that completely and accurately captures data that reflect the true measurement of the observation. They should demonstrate that the performance characteristics of the mobile technology, including all necessary algorithms, are acceptable in terms of its sensitivity, specificity, accuracy, and precision. For example, sponsors should know that the pedometer used in their study accurately and reliably measures the true number of steps a patient walked.

5. What steps does your company take to ensure your technology collects precise measurements of the observation? **[Interviewer: Be sure answer is clear regarding “currently does” versus “would do.”]**  
**[Probe as needed]**
  - a. Does your company conduct validation studies of your technology internally or is it done externally? Why is that the case?
  - b. What comparative measurement is used to validate the technology’s record? How was this measurement chosen?
  - c. In what type of environment was the validation conducted – naturalistic or controlled or both? Why?
6. What evidence do you provide to sponsors so they are aware of the procedures used to validate the technology for specific measures?

### Section D. Device validation

FDA regulations require that sponsors demonstrate that validation testing was performed on the mobile technology used in their research to ensure that it is reliably capturing, transmitting, and recording data and is able to produce accurate, reliable, and complete records. So, for example, if a wearable detects a heart rate of 80 bpm, validation should ensure that the value is correctly and reliably captured, transmitted, and recorded in the sponsor’s electronic data collection system.

7. What steps does your company take to ensure your technology consistently and accurately reports participant data? **[Interviewer: Be sure answer is clear regarding “currently does” versus “would do.”]**  
**[Probe as needed]**
  - a. What are/would be your company’s procedures for validating that the technology is reporting **accurate** results?
    - i. How is your technology able to discern records that may have been altered and are therefore not accurate?
  - b. What are/would be your company’s procedures for validating the technology is reporting **reliable – or consistent** – results?  
What are/would be your company’s procedures for validating that your technology is able to **discern invalid, missing or out-of-range** results?**[If no validation procedure done]** What would need to be done to be able to validate the technology is reliably capturing, transmitting, and recording data?

8. How do factors such as environmental conditions, a technology's battery life and/or memory affect the accuracy of recording and reporting participant's data? ***[Interviewer: probe for whether extreme heat/cold, battery and/or memory problems would create problems with the way data are stored, gaps in the data set, etc.]***
  - a. How is the accurate recording and reporting of participant's data affected if the technology is out of range of a wireless network? ***[Interviewer: probe for whether being out of wireless range would create problems with the way data are stored, gaps in the data set, etc.]***
9. What evidence do you provide to sponsors so they are aware of your validation procedures?

### **Section E. Data attribution**

Sponsors should demonstrate that data collected from a mobile technology are attributable to a single authorized source; for example, an enrolled participant. Since many studies use mobile technology remotely, verifying attribution of data elements in an electronic data set can be difficult, particularly when data are remotely uploaded from a mobile technology.

10. What specific features or functions of your technology demonstrate that the intended users are the only users of the device?  
***[Probe as needed]***
  - a. How are data from your technology recorded so the "originator" can be easily identified by the investigator? ***[Originator = "...a person, a computer system, a device, or an instrument that is authorized to enter, change, or transmit data elements into the eCRF (also sometimes known as an author). Each data element is associated with an origination type that identifies the source of its capture in the eCRF." – FDA Guidance for Industry]***

***[Interviewer: If interviewing a device manufacturer who is not involved in data management, go to the closing section of the interview guide.]***

### **Section F. Audit trail**

Sponsors should provide a detailed and accurate data audit trail to the FDA for review. The audit trail should include documentation of the timing and originator of each data element in the study's dataset. Additionally, any changes to the "source data" – or the original data collected – should be documented with the date and signature of the authorized personnel without obscuring the original data element.

11. What specific features or functions of your technology allow sponsors to fulfil this requirement?  
***[Probe as needed]***
  - a. ***[Ensuring data record is attributable]*** As we talked about earlier, all data elements need to be associated with an origination type that identifies the source of its capture, include the timing of capture and "author." How does the data output from your technology record this information?
  - b. ***[Ensuring data record is legible]*** Data should be presented in a clear and standardized format. This is to ensure legibility of the record and to reduce the risk of misreading the

data element. What does the data output from your technology look like (i.e., is the data reported in some standard format that is readable by most computers)?

- c. ***[Ensuring data record is original]*** Any conversion of “source” data (original data recorded by the device) to “converted” data (data reported after conversion from a standard or proprietary algorithm). How can data output from your technology be traced back to original source data?
- d. ***[Ensuring data record is accurate]*** What inspections are in place to monitor the performance of the technology, operating systems and data sharing platforms to ensure that data are not inadvertently corrupted during collection, transfer or storage?
- e. How are sponsors informed of any updates or changes to the device or operating systems – particularly, during the course of a study?

## **Section G. Data access**

We recently conducted interviews with clinical research investigators who use mobile technologies to collect data. They said it is essential that they have access to the source data collected by the technologies. Regulations require that the investigator reviews and certifies that the dataset is accurate and ready for review by monitors, sponsors and regulators.

12. What specific features or functions of your technology allow sponsors to fulfil this requirement?

***[Probe as needed]***

- a. How and when do/would investigators get access to the data collected by your technology if it were used in a clinical research?

## **Section H. Wrapping up**

13. In closing, is there anything else that you think it is important that sponsors should ask manufacturers about how their technology and/or data were validated?

That's the end of the questions that I have for you today. Do you have any final thoughts or questions that you'd like to ask about this study?

I want to sincerely thank you for your time and for the helpful information that you provided.

Thank you very much and I hope that you have a great day!

**DATA SECURITY EXPERT INTERVIEW GUIDE**  
**Mobile Devices in Clinical Research: Scientific and Technological Considerations and Challenges**  
**(Phase II)**

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## SECTION A: Information about the study

### Section A. Introduction

- Hello, thank you for taking time out of your busy schedule to speak with me today. My name is [Name], and I am a \_\_\_\_\_ with the Clinical Trials Transformation Initiative. Is now still a good time to talk?
- As you are well aware, the use of mobile devices within clinical research is rapidly growing. Yet, their use within phase 3 clinical trials, and particularly FDA-regulated trials, has not yet reached its full potential. This may be due in part to concerns among research sponsors and investigators about the multitude of scientific and technological considerations and challenges that should be addressed and overcome before mobile devices can be successfully used in clinical trials.
- The Clinical Trials Transformation Initiative – referred to as CTTI – is developing evidence-based recommendations to address this issue. We are interested in hearing your thoughts on how technological challenges in using mobile devices for data capture in FDA-regulated drug trials can be addressed and overcome.
- As you may know, in the US, clinical trial sponsors seeking FDA approval for a new therapeutic drug or medical device should abide by specific regulations. If data are collected from an electronic source, such as smartphone applications and wearable biosensors, the sponsor should ensure that procedures and processes are in place to safeguard the authenticity, integrity, and, when appropriate, the confidentiality of electronic records.
- I would like to know how data collected by mobile devices are made secure and accessible only to authorized personnel.
- To be clear, as we discuss “mobile devices” throughout this interview, we are referring to mobile applications and remote sensor devices, including both consumer and medical grade devices, that are used for outcome data capture in clinical trials.
- Also, for the purpose of this interview, we will define the use of these mobile devices in clinical trials as the use of mobile technology to collect objective or patient-reported data during a clinical trial. We are not focused on the use of mobile devices for recruitment, retention and informed consent.
- There are no right or wrong answers to the questions I will ask, only opinions. Please feel free to share your candid thoughts to the questions that I ask you.
- As described in the informational sheet provided to you earlier, participating in this interview is voluntary. You can choose not to answer a question or you can stop participating at any time. We do not think there will be any personal risks or benefits from the interview today. However, there is a risk of loss of confidentiality. This means that people outside the study team could learn what you said in the interview. But we think this is unlikely because we do many things to protect the information you tell us such as storing your data on secure servers.

- If you agree, I would like to audio record the interview because I want to make sure I don't miss any of your comments. If you don't want the interview audio recorded, I will take detailed notes during the interview instead.
- The interview will take roughly 1 hour. Information about who to contact if you have questions about the study, including the Duke IRB, can be found in the informational sheet.
- Do you have any questions for me so far about the interview?

***[If yes, answer the participant's questions then proceed with the interview.]***

***[If no, proceed with the completing the interview.]***

Is it okay if I turn on the audio recorder now?

***[If yes, begin audio recording now.]***

***[If no]*** That's okay, I'll take detailed notes as we talk.

Ok, let's get started!

## **Section B. Background**

14. Briefly, could you describe your role in your organization/company/university?
15. How does your organization/company/university serve the data security needs of your clients/employees?
16. To your knowledge, have you or your organization/company/university team ever worked in partnership with clinical researchers before?
  - a. ***[If yes]*** How were you or your organization/company/university/team involved in the research?
17. Are you familiar with the FDA regulations governing clinical research?
  - a. ***[If yes]*** What can you tell me about them?
  - b. ***[If no]*** Don't worry about it, we will briefly summarize some of the data security issues clinical trial sponsors and investigators are interested in learning more about.

## **Section C. Data security**

Confidentiality of research data is a foundation of good clinical practice. Access to research data ought to be limited to authorized personnel only, which in some cases may exclude patients, some study staff and even mobile technology manufacturers.

18. What security measures would you recommend be in place to ensure data collected by mobile technologies remain accessible only to specific authorized personnel?

***[Probe as necessary]***

- a. What are the minimum security measures to have in place for mobile technologies?

***[Probe for hardware and/or software security measures]***

- b. What are the minimum security measures to have in place for services helping to transform, deliver, or store the data (e.g., Amazon Web Services)?
- c. What would be the best, yet realistic ***[i.e., feasible given current technologies]***, security measures?
- d. How might these measures vary by the type of technology? For example, data collected via apps or cloud-enabled devices versus Bluetooth-enabled devices connected via an app on the phone.
- e. What specific features or functions could potentially be automated or otherwise standardized in the technology itself?
- f. What specific security procedures should be included in the trial itself, when mobile technologies are used to collect data?
- i. How are these different from security procedures in traditional – not mobile – clinical trials?

19. At the very least, who needs to have access to data collected from mobile technologies during a trial to ensure data have not been corrupted or edited during collection and/or transfer? ***[Probe for multiple answers]***

- a. Why these people?
- b. What data do they need access to?
- c. What have been your experiences with device manufacturers' access to study data?
- i. What do you allow access to?
- ii. What must be restricted?

**Section D. BYOD**

Some clinical research sponsors and investigators have expressed interest in patients using their own technologies, such as their own smartphones, to collect research outcome data.

20. What security challenges does this introduce?
- a. ***[For each challenge mentioned]*** How could that challenge be addressed?

**Section E. Top Security Recommendations**

21. What are the top three things that research sponsors and investigators need to consider when thinking about ensuring the confidentiality of patient data collected on a mobile device?
- a. ***[For each topic, follow-up with]*** How can they ensure this is done effectively?

That's the end of the questions that I have for you today. Do you have any final thoughts or questions that you'd like to ask about this study?

I want to sincerely thank you for your time and for the helpful information that you provided.

Thank you very much and I hope that you have a great day!

**BIostatistician Interview Guide**  
**Mobile Devices in Clinical Research: Scientific and Technological Considerations and Challenges**  
**(Phase II)**

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14. Participant ID#	
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## SECTION A: Information about the study

### Section A. Introduction

- Hello, thank you for taking time out of your busy schedule to speak with me today. My name is [Name], and I am a \_\_\_\_\_ with the Clinical Trials Transformation Initiative. Is now still a good time to talk?
- As you are well aware, the use of mobile devices within clinical research is rapidly growing. Yet, their use within phase 3 clinical trials, and particularly FDA-regulated trials, has not yet reached its full potential. This may be due in part to concerns among research sponsors and investigators about the multitude of scientific and technological considerations and challenges that should be addressed and overcome before mobile devices can be successfully used in clinical trials.
- The Clinical Trials Transformation Initiative – referred to as CTTI – is developing evidence-based recommendations to address this issue. Recently, we interviewed clinical research sponsors and investigators on their use of mobile technology to collect data in clinical trials.
- An important finding from those interviews was the need for better FDA guidance on their review requirements for clinical trial data collected via mobile technology, when data are submitted for regulatory approval. Specifically, some sponsors and investigators wanted clarity on how to provide data to FDA for review that were collected remotely, or in a free-living rather than controlled environment, and potentially collected with greater frequency than in traditional trials.
- Today we want to talk with you about your thoughts and recommendations on the possible ways such data can be provided to FDA for their review.
- To be clear, as we discuss “mobile devices” throughout this interview, we are referring to mobile applications and remote sensor devices, including both consumer and medical grade devices, that are used for outcome data capture in clinical trials.
- Also, for the purpose of this interview, we will define the use of these mobile devices in clinical trials as the use of mobile technology to collect objective or patient-reported data during a clinical trial. We are not focused on the use of mobile devices for recruitment, retention and informed consent.
- There are no right or wrong answers to the questions I will ask, only opinions. Please feel free to share your candid thoughts to the questions that I ask you.
- As described in the informational sheet provided to you earlier, participating in this interview is voluntary. You can choose not to answer a question or you can stop participating at any time. We do not think there will be any personal risks or benefits from the interview today. However, there is a risk of loss of confidentiality. This means that people outside the study team could learn what you said in the interview. But we think this is unlikely because we do many things to protect the information you tell us such as storing your data on secure servers.

- If you agree, I would like to audio record the interview because I want to make sure I don't miss any of your comments. If you don't want the interview audio recorded, I will take detailed notes during the interview instead.
- The interview will take roughly 1 hour. Information about who to contact if you have questions about the study, including the Duke IRB, can be found in the informational sheet.
- Do you have any questions for me so far about the interview?

***[If yes, answer the participant's questions then proceed with the interview.]***

***[If no, proceed with the interview.]***

Is it okay if I turn on the audio recorder now?

***[If yes, begin audio recording now.]***

***[If no]*** That's okay, I'll take detailed notes as we talk.

Ok, let's get started!

## **Section B. Biostatistician engagement**

Let us begin by getting a little more information about your role as a biostatistician.

1. Please describe your role as a biostatistician for clinical trials.
  - a. What kind of company do you work for? ***[Probe specifically for industry, academia, other]***
2. For traditional trials, where mobile devices are not used to collect data, when do you typically first get involved in the trial?
3. How has/might your role change for clinical trials that use mobile technologies to collect data? ***[Probe, if necessary]***
  - a. When would you first get involved in the study (e.g., planning, during device selection, internal validation of technology, etc.)?
  - b. Any change to the level of engagement required due:
    - i. To increase volume of data received?
    - ii. Novelty of endpoints?

## **Section C. New considerations in Mobile Trials**

As you are quite familiar with, source data and source documentation should meet fundamental elements of data quality – specifically, that data are attributable, legible, contemporaneous, original, and accurate – and should comply with all applicable statutory and regulatory requirements. Additionally, FDA's acceptance of data from clinical trials for decision-making purposes depends on the agency's ability to verify the quality and integrity of the data during on-site inspections and audits (21

CFR 312 and 812). **[Only state if necessary: To clarify, “source data” refers to “all information in original records and certified copies of original records of clinical findings, observations, or other activities in a clinical trial necessary for the reconstruction and evaluation of the study” (Guidance for Industry: Electronic Source Data in Clinical Investigations).]** Data quality and integrity regulations apply to recorded source data transmitted from automated instruments directly to a computerized system – for example, data from a chemistry auto-analyzer or a wearable health monitor to a laboratory information system.

We want to talk with you today about three types of scenarios for collecting data using mobile technologies and how these data are provided to FDA for regulatory review. As you are familiar with, mobile technologies, including remote monitors and smartphone applications, have the potential to introduce new considerations on how data from patients are collected, stored, interpreted and presented for FDA review. Some of the key differences identified in our prior research were that mobile technologies can allow for:

- More patient-driven data collection
- More data collected in free-living scenarios, and
- Higher frequency of data collection.

While these are not mutually exclusive topics, nor are they mutually dependent, they each bring new benefits and challenges to traditional clinical trials.

4. Of these three topics, which, if any, do you feel potentially impact the way data are recorded, interpreted and made available to the FDA for regulatory review?

**[Based on the participant’s response to question one, probe specifically about that topic/s in the following sections. If, to question one, they respond that none of the bulleted topics will impact the way data, then probe “Why” for each of the topics.]**

### **Section C. Patient-generated data**

**Now I’d like to focus specifically on factors related to the patients’ use of mobile technologies to provide data for clinical trials. Through the use of mobile technologies, clinical trial investigators and sponsors can now engage patients directly as data-gatherers. Data can either be inputted directly into the device by the patient or collected passively by the device as the patient carries or uses it throughout the day.**

5. As a biostatistician, what benefits or potential benefits do you see, if any, to data collected actively or passively by patients compared to data typically collected by clinicians and trial staff?
  - a. **[If yes]** What are they? **[Probe for multiple options]**
6. What concerns do you have regarding data generated from patient-controlled mobile devices?
  - a. Do these concerns vary by data collected through active versus passive patient engagement with the technology? Why?
  - b. **[If concerns are expressed]** How can those concerns be addressed or mitigated?

7. How does data generated from patient-controlled mobile devices impact the way data are recorded?
  - a. ***[If a concern is expressed]*** How would you suggest ensuring data are recorded in a way that allows for analysis?
  
8. The next two questions are about how the use of patient-controlled mobile devices impact the way data are analyzed and interpreted. So, first, let me ask about analysis. How does data generated from patient-controlled mobile devices data impact the way data are analyzed?
  - a. ***[If a concern is expressed]*** How could that be addressed?
  
9. Now, how does data generated from patient-controlled mobile devices data impact the way data are interpreted?
  - a. ***[If a concern is expressed]*** How could that be addressed?
  
10. How do data generated from patient-controlled mobile devices change the way data are made available to the FDA for review, in comparison to traditional trials?
  - a. What suggestions do you have about how to prepare data collected from patient-controlled mobile devices so they are made available to FDA in a way that FDA is used to for verifying the quality and integrity of the data?
    - i. Are there potential alternative ways of preparing the data for FDA review that would better suit data collected from patient-controlled mobile devices?
      1. ***[If yes]*** What are they? ***[Probe for multiple options]***

#### **Section D. Free-living data**

11. In your role as a biostatistician for clinical trials, what benefit do you see, if any, to collecting data during free-living as opposed to controlled activity scenarios?
 

***[If necessary, clarify that it's assumed that traditional trials would collect data during in-clinic visits as opposed to when patients are engaging in their everyday activities. Prior interviewees have noted that free-living scenarios may reduce biases introduced by data only collected at specific time points or when patients are in the controlled environment of the clinic. However, these scenarios may introduce new challenges to data interpretation.]***

  - a. ***[If yes]*** What are they? ***[Probe for multiple responses.]***
  
12. What concerns do you have regarding data collected in free-living scenarios as opposed to controlled scenarios?
  - a. How can those concerns be addressed or mitigated?
  
13. How does free-living data impact the way data are recorded?
  - a. What suggestions do you have about how to ensure that data are recorded in a way that allows for analysis?
 

***[Probe if necessary]***
  - b. Time and date of data elements are already typically included in data sets. Should information about location of data elements be included in data origination labeling?
    - i. Why?

14. The next two questions are about how the use of patient-controlled mobile devices impact the way data are analyzed and interpreted. So, first, let me ask about analysis. How does free-living data impact the way data are analyzed?
  - a. ***[If a concern/difficulty is expressed]*** How could that be addressed?  
**[Probe if necessary]**
  - b. What, if any, considerations need to be made to a data analysis plan that incorporates data collected during free-living activities?
15. Now, how does free-living data impact the way data are interpreted?
  - a. ***[If a concern/difficult is expressed]*** How could that be addressed?
16. How do free-living data change the way data are made available to the FDA for review, in comparison to traditional trials?
  - a. What suggestions do you have about how to prepare free-living data so they are made available to FDA in a way that FDA is used to for verifying the quality and integrity of the data?
    - i. Are there potential alternative ways of preparing the data for FDA review that would better suit data collected in a free-living scenario as opposed to a controlled setting?
      1. ***[If yes]*** What are they? ***[Probe for multiple options]***

## Section E. Higher sampling frequency

Now, I'd like to hear your thoughts on using mobile technologies to collect data at higher frequencies than is typically done in traditional clinical trials.

17. In your role as a biostatistician for clinical trials, what benefit do you see, if any, to collecting data at higher sampling frequencies than is currently done in traditional trials?  
***[If necessary, clarify that "higher frequency" may be a range of data collection epochs; for example, sampling activity data every millisecond for tremor-related conditions to every few minutes for general daily activity endpoints.]***
18. What concerns do you have, if any, with data being collected at a higher frequency than in traditional trials?
  - a. ***[If concerns are expressed]*** How can those concerns be addressed or mitigated?
  - b. What concerns do you have, if any, about the concurrent use of multiple devices by the same patient that sample at various frequencies?
    - i. ***[If concerns are expressed]*** How can those concerns be addressed or mitigated?
19. How does collecting data at a higher frequency impact the way the data are recorded?
  - a. What suggestions do you have about how to ensure that data are recorded in a way that allows for analysis?
20. The next two questions are about how the use of patient-controlled mobile devices impact the way data are analyzed and interpreted. So, first, let me ask about analysis. How does collecting data at a higher frequency impact the way the data are analyzed?
  - a. ***[If a concern is expressed]*** How could that be addressed?

21. How does collecting data at a higher frequency impact the way the data are interpreted?
  - a. ***[If a concern is expressed]*** How could that be addressed?
  
22. How does collecting data at higher frequency change the way data are made available to the FDA for review, in comparison to traditional trials?
  - a. What suggestions do you have about how to prepare the vast amount of data that is potentially collected during the trial so they are made available to FDA in a way that FDA is used to for verifying the quality and integrity of the data?
    - i. Are there potential alternative ways of preparing the data for FDA review that would better suit data collected at higher frequencies?
      1. ***[If yes]*** What are they? ***[Probe for multiple options]***

## Section F. Data Attribution

Thank you for sharing your thoughts thus far. I only have a few more questions. My final questions are related to data attribution.

During the initial interviews with sponsors and investigators we asked about how they ensured that data collected remotely by a mobile technology was attributable to the specific intended participant. Interviewees described using unique passcodes – including biomarkers such as fingerprints – and enabling location tracking on the technology. Some also said they review trends in the dataset and look for differences between data collected by one participant versus another — or look at differences in data from one participant over time that may indicate that data were collected by someone who was likely not the participant.

23. What are your thoughts on the appropriateness of reviewing trends in the data to assess whether or not the data were produced by a single intended user?
  - a. ***[If positive reaction to use of trend data]*** What evidence would be needed to support the claim that trend data is a good indicator for the attribution of individual data elements?
  - b. ***[If trend data are not appropriate]*** Why not?
  - c. What would you suggest doing if you had any doubts about the attribution of the data?
  - d. What other ways could be used to ensure data are attributable to a unique source by looking at the data from these devices?

## Section G. Wrapping Up

24. In closing, is there anything else that you want to share that you think is important for sponsors to consider regarding how data collected remotely are recorded, analyzed, interpreted, and reported to the FDA?

That's the end of the questions that I have for you today. Do you have any final thoughts or questions that you'd like to ask about this study?

I want to sincerely thank you for your time and for the helpful information that you provided.

Thank you very much and I hope that you have a great day!