

EHR Usability Test Report

Product: Chiro Quick Charts version 2.9.322

Date of Test: August 1, 2019 to September 3, 2019

Date of Report: September 5, 2019

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Note: The following study was developed using the NISTIR 7742 template as a guide for reporting our findings: *Customized Common Industry Format Template for Electronic Health Record Usability Testing.*

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EXECUTIVE SUMMARY

A usability test of Chiro Quick Charts version 2.9.322, a full EHR system, was conducted from August 1, 2019 to September 3, 2019 in a virtual environment by DB Consultants, Inc. The purpose of this test was to test and validate the usability of the current EHR user interface, and to provide evidence of this usability in the Chiro Quick Charts software.

During the usability test, 8 chiropractic providers and 2 healthcare professionals (EHR users) served as participants and used the EHR in simulated, but representative tasks.

This study collected performance data on 8 tasks typically conducted on an EHR:

- Section 170.315(A3) Computerized provider order entry – diagnostic imaging
- Section 170.315(A5) Demographics
- Section 170.315(A6) Problem list
- Section 170.315(A7) Medication list
- Section 170.315(A8) Medication allergy list
- Section 170.315(A9) Clinical decision support
- Section 170.315(A14) Implantable device list
- Section 170.315(B2) Clinical information reconciliation and incorporation

During the 30 to 60 minute one-on-one usability test, each participant was greeted by the administrator and asked to review the tasks they were to perform. They were instructed that they could withdraw at any time.

All participants had prior experience with the EHR. They were also provided training materials (user manual documentation) prior to the test to introduce them to new concepts.

The administrator introduced the test, and instructed participants to complete a series of tasks (given one at a time) using the Chiro Quick Charts software. During the testing, the administrator timed the test and recorded user performance data on paper and electronically. The administrator did not give the participant assistance in how to complete the tasks.

The following types of data were collected for each participant:

- Number of tasks successfully completed within the allotted time without assistance
- Time to complete the tasks
- Steps taken to complete the tasks
- Path deviations
- Participant's satisfaction ratings of the system

All participant data was de-identified – no correspondence could be made from the identity of the participant to the data collected. Following the conclusion of the testing, participants were asked to

complete a post-test questionnaire and were compensated with a \$50.00 gift card for their time. Various recommended metrics, in accordance with the examples set forth in the NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records, were used to evaluate the usability of the EHR. Following is a summary of the performance and rating data collected on the EHR.

Task	# of Participants	Task Success	Avg. Time to complete	Avg. Steps to complete	Deviations	Task Rating 5=Easy	Risk Rating 5=No Risk
A3 Imaging Orders	8	100%	4.5 minutes	13.3	6	4	5
A5 Demographics	8	100%	4.2 minutes	20.3	7	5	5
A6 Diagnosis List	8	100%	1.5 minutes	6.5	4	5	5
A7 Medication List	8	100%	3.4 minutes	13.1	7	4	4
A8 Medication Allergy	8	100%	2.9 minutes	13.1	5	4	4
A9 CDS Rules	8	100%	11.2 minutes	57.5	11	3	3
A14 Implantable Devices	8	100%	1.8 minutes	11	7	4	4
B2 Clinical Reconciliation	8	100%	3.7 minutes	16.8	4	4	5

The results from the System Usability Scale scored the subjective satisfaction with the system based on performance with these tasks to be: 85%

In addition to the performance data, the following qualitative observations were made by the participants:

Major findings:

- It followed a logical sequence and wasn't as difficult as I anticipated.
- It provides what is required today of EHRs and is thorough.
- The tasks are fairly easy to complete.
- The first time may be difficult due to having to look for buttons etc. Do it once or twice and is a piece of cake.
- It is good to learn some new tasks and easy to use.
- The process is arranged in a logical manner and, once familiar with the system, completing tasks is easy.
- Easily done once you figure it out.
- Using the system on a daily basis, it's generally fairly easy to navigate.
- Easy flow and easy to understand.

Areas for improvement offered by participants:

- I'd like to view the last Outcome assessments, and make my date changes in quick soap without having to go back to the main screen if possible.
- More "Wellness/Functional Medicine" geared tabs.
- Diagnosis codes and tab specific to wellness/functional medicine.
- Add the disability indices so they automatically populate in goals.

INTRODUCTION

The EHR tested for this study was Chiro Quick Charts version 2.9.332, a complete EHR. The system is designed to present a complete and comprehensive digital format of a patient's medical chart, with real-time, patient-centered records and present medical information to healthcare providers in an ambulatory setting.

The usability testing attempted to represent realistic exercises and conditions. The purpose of this study was to test and validate the usability of the current user interface, and provide evidence of usability in the EHR. To this end, measures of effectiveness, efficiency and user satisfaction, such as time to perform tasks, steps to complete tasks, etc. were captured during the usability testing.

METHOD

Participants

A total of 10 participants were tested on the EHR. Participants in the test were 8 Chiropractors and 2 Health Care Professionals. Participants were recruited by Nancy Murnin from DB Consultants, Inc. and were compensated with a \$50.00 gift card for their time. In addition, participants had no direct connection to the development of, or organization producing, the EHR. Participants were not from the testing or supplier organization. Participants were given the opportunity to have the same orientation and level of training as the actual end users would have received.

Recruited participants had a mix of backgrounds and demographic characteristics conforming to the recruitment screener. The following is a table of participants by characteristics, including demographics, professional experience, computing experience and user needs for assistive technology. Participant names were replaced with Participant IDs so that an individual's data cannot be tied back to individual identities.



PRACTICE MANAGEMENT + EHR + SCHEDULING

Identifier	Gender	Age	Education	Occupation	Professional Experience (mos)	Computer Experience(mos)	Product Experience(mos)	Assistive Technology Needs
#1	Male	60-69	Doctorate degree	Chiropractic Physician	446	95	95	No
#2	Male	60-69	Doctorate degree	Chiropractor	421	95	49	No
#3	Male	60-69	Bachelor's degree	Chiropractor	420	72	72	No
#4	Female	60-69	Doctorate degree	Chiropractor	450	60	60	No
#5	Male	50-59	Doctorate degree	Chiropractor	396	72	72	No
#6	Male	50-59	Doctorate degree	Chiropractor	324	82	82	No
#7	Female	60-69	Doctorate degree	Chiropractor	372	83	83	No
#8	Male	30-39	Bachelor's Degree	Director of Therapeutic Svc	130	84	84	No
#9	Male	60-69	Doctorate degree	Chiropractor	396	240	48	No
#10	Male	30-39	Some college	Chiropractic Asst.	60	60	60	No

Eleven participants (matching the demographics in the section on Participants) were recruited and ten participated in the usability test. One participant declined to participate in the study.

Participants were scheduled for 30-60 minute sessions with a few minutes in between each session for debrief by the administrator and to reset systems to properly test conditions. A spreadsheet was used to keep track of the participant schedule, and included each participant’s demographic characteristics as provided by the recruiting firm.

STUDY DESIGN

The study was designed to show areas where the product performed well, specifically effectively, efficiently, and thoroughly. It was also designed to pinpoint areas where the product failed to meet the needs of the participants. The data from this test may serve as a baseline for future tests with an updated version of the same EHR and/or comparison with other EHRs provided the same tasks are used. In short, this testing serves as both a means to record or benchmark current usability, but also to identify areas where improvements must be made.

During the testing phase, each participant interacted with the same EHR software. They used the same computer, the same data, and were given the same instructions and tasks to perform. The system was evaluated for effectiveness and efficiency as measured by the data collected and analyzed for each participant.

- Number of tasks completed
- Time to complete each task
- Number of steps to complete each task
- Number of deviations
- Participant’s satisfaction rating with the system

TASKS

A number of tasks were constructed that would be realistic and representative of the types of activities a user might do with this EHR, including:

- Request an Imaging Order
- Modify a requested Imaging Order
- Entering a patient's Demographics
- Change a patient's Demographics
- Enter a Diagnosis code on a chart
- Mark a Diagnosis code as a non-problem
- Enter a patient's medications
- Enter a patient's medication allergies
- Mark a medication as not currently taking
- Create Clinical Decision Rules for Problems, Medications, Vital signs, Lab orders, Demographics
- Trigger the Clinical Decision Rules created
- Add and validate an Implantable Device
- Modify an Implantable Device
- Perform a Clinical Reconciliation for Medications, Medication Allergies and Diagnosis
- Create a new patient CCD file

Tasks were selected based on their frequency of use, criticality of function, and those that may be most troublesome for users. Tasks should always be constructed in light of the study objectives.

PROCEDURES

To begin the test, participants were individually greeted, their identity was verified, and they were connected remotely using GoToMeeting. The usability administrator was an experienced usability practitioner with 9 years of experience in training and supporting the EHR product being tested. The administrator moderated the session including administering instructions and tasks. The administrator also monitored task times, obtained post-task rating data, and took notes on participant comments. Participants were instructed to perform the tasks (see specific instructions below):

- As quickly as possible
- With as few errors or deviations as possible
- Without assistance - the administrator was allowed to give clarification and immaterial guidance, but no instructions on use
- Without a think aloud technique

For each task, the participants were given a written copy of the task. Task timing began once the administrator finished reading the question. The task time was stopped once the participant indicated they had successfully completed the task. Scoring is discussed below.

Following the session, the administrator gave the participant the post-test questionnaire. A thank you card and gift card were subsequently mailed to them to compensate them for their time, and thank each individual for their participation. After a week or so, each participant was contacted by phone to confirm they received the card.

Participants' demographic information, task success rate, time on task, errors, deviations, verbal responses, and post-test questionnaire were recorded into a spreadsheet.

TEST LOCATION

The test was administered in a remote setting where participants were individually tested. Only the test administrator was on the call with the participants while the study was being administered.

TEST ENVIRONMENT

The Chiro Quick Charts EHR software would typically be used in a healthcare office or facility. In this instance, the testing was conducted remotely using GoToMeeting to connect the tester to the testing facility. Although the type of computer, operating system and display resolution of the remote participant system was unknown, the system that was used by the test administrator and controlled by the remote participant was a Dell Inspiron Laptop running the Windows 10 Professional operating system at a resolution of 1920x1080 pixels. Users also used a mouse and keyboard while interacting with the EHR.

The Chiro Quick Charts application used is a server-client solution. The application was set up by DB Consultants, Inc. according to the documentation describing the system set-up and preparation. The application itself was running on a Windows 10 Professional using a test database on a LAN / WAN connection. Technically, the system performance (i.e., response time) was representative to what actual users would experience in a field implementation. Additionally, participants were instructed not to change any of the default system settings (such as control of font size).

TEST FORMS AND TOOLS

During the usability test, various documents and instruments were used, including:

- Moderator's Guide
- Post-test Questionnaire
- Timer

Examples of these documents can be found in the Appendix section. The Moderator's Guide was devised so as to be able to capture required data.

PARTICIPANT INSTRUCTIONS

The administrator read the following instructions aloud to the each participant:

Thank you for participating in this study. Your input is very important and we could not do this without your help. Our session today will last about 30-60 minutes. During that time you will have access to a few electronic health records. I will ask you to complete a few tasks using this system and answer some questions. You should complete the tasks as quickly as possible making as few errors as possible. Please try to complete the tasks on your own following the instructions very closely. Please note that we are not testing you we are testing the usability of Chiro Quick Charts, therefore if you have difficulty all this means is that something needs to be improved in the system. I will be here in case you need specific help, but I am not able to instruct you or provide help in how to use the application.

Overall, we are interested in how easy (or how difficult) this system is to use, what in Chiro Quick Charts would be useful to you, and how we could improve it. I did not have any involvement in its creation, so please be honest with your opinions. All of the information that you provide will be kept confidential and your name will not be associated with your comments at any time. Should you feel it necessary you are able to withdraw at any time during the testing.

Following the procedural instructions, participants were shown the EHR and as their first task, were given time to explore the system and make comments. Once this task was complete, the administrator gave the following instructions:

For each task, I will read the description to you and say "Begin." At that point, please perform the task and say "Done" once you believe you have successfully completed the task. I would like to request that you not talk aloud or verbalize while you are doing the tasks.

Participants were then given eight tasks to complete. Tasks are listed in the moderator's guide in the Appendix.

USABILITY METRICS

According to the *NIST Guide to the Processes Approach for Improving the Usability of Electronic Health Records*, EHRs should support a process that provides a high level of usability for all users. The goal is for users to interact with the system effectively, efficiently, and with an acceptable level of satisfaction. To this end, metrics for effectiveness, efficiency and user satisfaction were captured during the usability testing. The goals of the test were to assess:

- Effectiveness of Chiro Quick Charts by measuring participant success rates and errors
- Efficiency of Chiro Quick Charts by measuring the average task time and path deviations
- Satisfaction with Chiro Quick Charts by measuring ease of use ratings

DATA SCORING

The following table details how tasks were scored, errors evaluated, and the time data analyzed.

Measures	Rationale and Scoring
Task Success	A task was counted as a “Success” if the participant was able to achieve the correct outcome, without assistance.
Task Time	Timing started when the administrator said ‘Begin’. The time ended when the participant said ‘Done’. In the event that the participant finished, and did not say ‘Done’, the administrator stopped the clock when it was clear the participant had completed the task.
Path Deviations	The participant’s path (i.e., steps) through the application was recorded. Deviations occur if the participant, for example, went to a wrong screen, clicked on an incorrect menu item, followed an incorrect link, or interacted incorrectly with an on-screen control. This path was compared to the optimal path. The number of steps in the observed path is divided by the number of optimal steps to provide a ratio of path deviation.
Task Rating	Participant’s subjective impression of the ease of use was measured by administering a post-session questionnaire. The participants were asked to rate the overall ease of each task on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree) To measure participants’ confidence in and likeability of the Chiro Quick Charts software, the testing team administered a post-test questionnaire. Questions included those addressing the ease of use of the system and participants’ thoughts on how quickly a user could learn the system. See full questionnaire in the Appendix.

RESULTS

Data Analysis and Reporting

The results of the usability test were calculated according to the methods specified in the Usability Metrics section above.

A summary of the testing results for Chiro Quick Charts are detailed below. The table below identifies the tasks performed and the performance level and satisfaction for each task. The results should be seen in light of the objectives and goals outlined in Section 3.2 Study Design. The data should yield actionable results that, if corrected, yield material, positive impact on user performance.

Task	# of Participants	Task Success	Avg. Time to complete	Avg. Steps to complete	Deviations	Task Rating 5=Easy
A3 Imaging Orders	8	100%	4.5 minutes	13.3	6	4
A5 Demographics	8	100%	4.2 minutes	20.3	7	5
A6 Diagnosis List	8	100%	1.5 minutes	6.5	4	5
A7 Medication List	8	100%	3.4 minutes	13.1	7	4
A8 Medication Allergy	8	100%	2.9 minutes	13.1	5	4
A9 CDS Rules	8	100%	11.2 minutes	57.5	11	3
A14 Implantable Devices	8	100%	1.8 minutes	11	7	4
B2 Clinical Reconciliation	8	100%	3.7 minutes	16.8	4	4

As the table above shows, relative to optimal performance standards as defined by Chiro Quick Charts, participant performance in the Chiro Quick Charts usability test was quite satisfactory. The overall average task completion rate was 100 percent and satisfaction rate was 67%.

Reliability

During the entire data collection phase, it was observed that Chiro Quick Charts provided a consistent interface to each participant as they completed their tasks. As each participant completed their assigned tasks, the system provided the same information and responded to their input with the same verbiage, using the same mode of communication (e.g. Pop-up messages).

Effectiveness

Participants in the study experienced no system errors when completing the tasks, including applications they typically do not use in their Chiropractic profession, such as Clinical Reconciliation or Implantable devices.

Efficiency

All participants completed all the tasks within an acceptable time. Due to the flexibility of Chiro Quick Charts, some tasks were completed more quickly than the calculated optimal time, while several tasks took slightly longer than expected. For example, to get to the Demographics screen for the A5 task, it can take as few as 3 steps or as many 6 steps, depending the path taken. All steps are acceptable but obviously some are less efficient.

Some participants made errors when attempting to complete their tasks, and had to restart their task. These errors were associated with those participants being unfamiliar with the task.

Satisfaction

Based on the data collected regarding satisfaction, most participants evaluated Chiro Quick Charts quite high. Most found the system had an easy work flow and was easy to navigate.

Areas for Improvement

The task completion rate was 100% which indicates that the system is highly usable and arranged in logical manner for Chiropractors to easily use in their daily practice. Nevertheless, there is always room for improvement, and several areas could be enhanced to improve overall participant satisfaction. Below are suggestions from our Post Test Questionnaire:

- More “Wellness/Functional Medicine” geared tabs.
 - Diagnosis codes and tab specific to wellness/functional medicine.
 - Capability to have separate complaints for acupuncture/wellness/functional medicine that only those patients are allowed to see/use. Don’t want every patient able to use them if not going to be seen for anything but chiropractic.
- Ability to have more than 1 active case open at same time. (I.e. chiro/acu/functional med)
- Capability to have other users leaves notations/patient quotes/conversations for Dr. in charts.
- Autocorrect feature
- Add the disability indices so they automatically populate in goals
- To view the last Outcome assessments , and make any date changes in quick soap without having to go back to the main screen if possible

Appendix

The following appendices include supplemental data for this usability test report. Following is a list of the appendices provided:

- 1: Recruiting screener
- 2: Participant demographics
- 3: EHR Usability Test
- 4: Post Test Questionnaire

APPENDIX 1: RECRUITING SCREENER

Recruiting script:

Hello, this is Nancy from DB Consultants. We are recruiting individuals to participate in a usability study for Chiro Quick Charts. We would like to ask you a few questions to see if you qualify and if you would like to participate. This should only take a few minutes of your time. This is strictly for research purposes and your identity will be kept confidential. If you are interested and qualify for the study, you will be paid to participate. Thank you.

1. What is your gender (if not obvious)
2. To which of the following age groups do you belong? (20-29, 30-39, 40-49, etc.)
3. What is your level of education?
4. What is your occupation or role in your organization?
5. How many years of experience do you have in your profession?
6. How many years of computer experience do you have, using any EHR software?
7. How many years of experience do you have using Chiro Quick Charts EHR software?
8. Do you require and assistive technologies to use a computer?

APPENDIX 2: PARTICIPANT DEMOGRAPHICS
GENDER

Male	8
Female	2
Total (participants)	10

AGE GROUP

30-39	2
40-49	0
50-59	2
60-69	6
Total (participants)	

LEVEL OF EDUCATION

Some College	1
Bachelor Degree	1
Doctorate Degree	8
Total (participants)	10

OCCUPATION/ROLE

Chiropractor	8
Director of Therapeutic Services	1
Chiropractic Assistant	1
Total (participants)	10

PROFESSIONAL EXPERIENCE

0-9	1
10-19	1
21-30	1
31-40	7
Total (participants)	10

COMPUTER EXPERIENCE (ANY EHR)

0-9	9
10-19	0
20-29	1
Total (participants)	10

CHIRO QUICK CHARTS EXPERIENCE

0-5	4
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	6-10	6
	Total (participants)	10
ASSISTIVE TECHNOLOGIES REQUIRED		
	Yes	0
	No	10
	Total (participants)	10

APPENDIX 3: EHR USIBILITY TEST

Instructions

Each of the 8 scenarios below ask you to complete certain tasks in within EHR. Training for each task was provided prior to the testing and you may not refer to those guides during the test. If you feel that you need additional guidance on any task prior to starting please let your test monitor know.

After completing each task please answer the series of questions and provide any feedback that you feel would make the task easier to use.

A3 – Imaging Orders

Using John Chiro, Enter a Radiology Request for Cervical Spine, AP & Lateral (72040)

Date of Study - 08/15/2019

Facility - Southside Radiology

Save the chart and close John Chiro

Reopen John Chiro and edit the Radiology order date of study to 08/10/2019

A5 – Demographics

Step 1

Using John Gender, edit the demographics screen and add the following data (you may choose any answer you wish):

- Preferred Language
- Date of birth
- Birth Sex
- OMB Race
- OMB Ethnicity
- Sexual Orientation
- Gender Identity

After entry, close the Patient screen

Step 2

Reopen the Demographic screen for John Gender and Change the following items to a different choice

- Preferred Language
- Date of birth
- Birth Sex
- OMB Race
- OMB Ethnicity
- Sexual Orientation
- Gender Identity

Close the Patient entry screen after our changes are made

Step3

Re-open the Demographic screen for John Gender

Verify that all info you entered is still visible

A6 – Diagnosis List

Check in John Chiro. Go to the Diagnosis screen and review entry

Add a new Dx code

Use the Non-Problems button to mark one code as a Non-Problem

Click on the History button and verify that you can view the past data

A7 – Medication List

Check in John Chiro and open the Medication list under Patient History

Update an existing entry, change the reason to Pain and check mark "This is not a current medication"

Add a new entry for Tylenol (any mixture)

Close John Chiro and reopen his chart. Return to the medication list and verify that your new entry is visible and at least one medication is listed as "Past"

A8 – Medication Allergy

Check in John Chiro and open the Medication list under Patient History

Add a new entry for Ibuprofen (any mix) and set the reason to Allergic to

Edit an existing entry that is marked Allergic to - check the box "This is not a current Medication"

Close John Chiro and reopen his chart. Return to the medication list and verify that your new entry is visible and at least one medication is listed as Allergic to and Past

A9 – CDS Rules

- Create the following CDS Rules:
- Problem List Rule
- Laboratory Test Rule
- Medication List Rule
- Medication Allergy Rule
- Vital Signs Rule
- Demographics Rule
- Combo Rule

A14 – Implantable Device List

Check in John Chiro and open Implantable Devices under Patient History

Press the plus sign to add a new entry and verify 00885556274866 is in the Device ID box and press Validate

Close out John Chiro

Reopen John Chiro and return to the Implantable device screen. Edit the entry using the green pencil button. Check or uncheck the box for "This is not a current implant"

B2 – Clinical Reconciliation

Open "Add Patient from CCD" from the File menu

Open the MyraJones.xml file, the location will be provided by DBC staff

Perform a reconciliation of Problems, Medications and Medication allergies

Open Myra Jones account and Save a new CCD file from the MU - Clinical Summary menu

APPENDIX 4: POST TEST QUESTIONNAIRE

1 – Strongly disagree

2 – Disagree

3 – Neutral

4 – Agree

5 – Strongly Agree

Using the Scale above, please provide answers for the following questions:

“I thought the system was easy to use to perform these tasks” -

“I believe most users would be able to complete the tasks successfully” -

“I believe these tasks would be easy for someone in our profession to learn” -

“The system is unnecessarily complex” -

“I feel that I could use this software to perform the tasks correctly” -

“The system makes it easy to correct mistakes in entry” -

“Important information is easy to identify” -

“The software workflow is easy to understand without technical assistance” -

“The system uses standard terms, units and symbols” -

“I would recommend the system to a friend or colleague” -

Please provide a brief impression of completing tasks in EHR:

Please provide a list of things you would like to improve: