A WEB-BASED USABILITY SURVEY OF THE ARMY
BEHAVIORAL HEALTH DATA PORTAL

by

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ABSTRACT

In 2008, Army Medical Command initiated a plan to standardize behavioral health

(BH) care practices across all Army installations. The current electronic medical

record was not capable of meeting the standardized practice needs of BH clinics.

Therefore, the Behavioral Health Data Portal (BHDP) was developed to help

standardize BH clinical data collection and outcome tracking. As BHDP

implementation was accelerated, determining the current BH provider usability and

acceptance of BHDP was imperative so implementation plans and future

enhancements of BHDP could be smartly shaped. A usability survey was developed

and sent to 1871 BH providers using BHDP and 442 completed the survey (24.7%).

Three hypotheses were tested: (1) Provider characteristics and computer familiarity

would affect usability levels; (2) Amount of BHDP use and proportion of clinical care

using BHDP will affect usability scores; and (3) BHDP use will positively affect

targeted clinical actions. The mean total System Usability Scale (SUS) score was 53.7

(SD =22.1). Provider characteristics and comfort with computers did not

significantly correlate with overall SUS scores. Months of BHDP use by a provider

and the percentage of clinical care with BHDP use both strongly correlated with

higher SUS scores (p-value <0.0001 and <0.001, respectively). Percentage of

provider clinical care with BHDP use also significantly correlated with provider

agreement that BHDP helped focus the initial patient interview, identify otherwise

missed clinical issues, and track patient treatment progress (all p-values <0.0001).

Higher SUS scores were strongly correlated with provider agreement with BHDP

enabling these clinical functions. The importance and meaning of these clinical findings are discussed along with some likely limitations with this data set.

INTRODUCTION

In 2008, the United States Army Medical Command embarked on a multi-year effort to build the structures needed to create a Behavioral Health Comprehensive System of Care. This effort aims to consistently fund and execute the best known behavioral health (BH) practices across more than fifty Army clinics and hospitals. The current Army BH system employs about two thousand BH providers who perform over 1.2 million encounters a year. Despite having a world-wide electronic medical record (EMR), called AHLTA (Armed Forces Health Longitudinal Technology Application), in the Department of Defense, the behavioral health functionality of AHLTA does not track lists of clinic patients, standardize patient self-report intake data, or track patient-reported clinical scales that are needed to determine BH outcomes. Since AHLTA is not amenable to functional enhancements within a reasonable time period, in 2011, the Army decided to build a web-based BH data application called the Behavioral Health Data Portal (BHDP). The primary intent of BHDP implementation is to standardized BH clinical care data collection at initial intake and at follow-up appointments. The standardized common data facilitates initial diagnostic decisions and tracking of patient treatment progress. As BHDP is rapidly implemented across all Army BH clinics, it is critical that an understanding of BHDP's current provider usage and acceptance is determined to ensure adequate provider training, ensure that BHDP is working as

intended, and inform subsequent BHDP development and implementation strategies. Therefore, a study of BHDP usability is needed to provide this understanding.

BACKGROUND

BHDP Development History. BHDP was built as a government-owned web-based application that must be run on military networks to comply with Army security standards. It is hosted inside a system of other web applications called the Medical Operations Data System (MODS). Even though a large majority of our patients were young adult active military service members, many BH clinics served other patient cohorts to include family members, retirees, and veterans. This meant that BHDP needed to be able to collect data from many types of patients. We also knew that many BH clinics did not have adequate floor space to install a sufficient number of hard-wired computer kiosks in their waiting rooms. Therefore, the BHDP team anticipated that some type of mobile device, like a netbook or tablet device, might need to be used on a patient's lap in a waiting room in order for there to be enough devices available to avoid creating a clinic flow choke point. This necessitated an initial focus by our team to build the patient data entry side with the constraint of using devices on a 10 inch screen or smaller with touch screen capability and to be able to be used by civilian and active-duty patients.

BHDP consists of a two portals, one for patients and another for providers and support staff. Patients log into the web application on a computer in a BH clinic prior to each appointment and answer standard questions related to their care (see patient portal screenshots in Appendix A). Providers can securely access their

portal from their computers to review data entered by patients. Data includes

graphical representation of clinical outcome scales and other important non-clinical

BH-related data imported from other data systems (see provider portal screenshots

in Appendix B). One of the most important aspects of any clinical data system is to

maximize usability to be maximized in order to take full advantage of the clinical

data reporting capability and to minimize the likelihood of providers missing

important data elements.

The initial version of BHDP was built between November and March 16th,

2012. Initially, BHDP implementation started with four pilot clinics and an 18-

month Army-wide roll-out plan was developed. In May 2012, senior Army medical

Figure 1 – BHDP use across the US Army BH Clinics
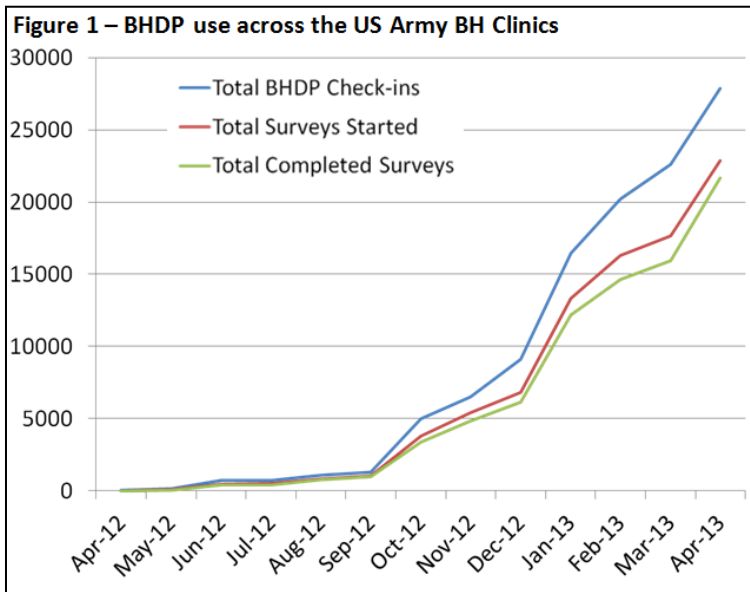
leaders asked our team to accelerate this process and to finish training at all Army BH clinics by December 2012. The BHDP team rapidly developed training materials, equipment

procurement plan and an Army wide implementation plan culminating with a

published operations order in August 2012 for the plan execution. Figure 1 shows

the growth of BHDP use in Army clinics over the last 12 months. Utilizing BHDP to

collect routine patient-entered data not only fundamentally changed the clinical

business process of BH clinics, but also changed how clinicians tracked treatment

outcomes. Most BH providers have never consistently used outcome measures in their treatment of patients. The BH documentation process was also affected since BHDP was collecting data from outside of AHLTA.

Importance of Usability Determination. Usability is a difficult concept to define. ISO 9241-11, published in 1998 as a general guidance, defines usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO 9241-11, 1998). Effectiveness refers to the ability for the specified users to complete tasks as intended, but completing tasks is not the only issue at hand. Many tasks can be completed without the aid of information technology (IT) systems. This is why the usability definition adds efficiency to the concept. This paper describes efficiency in terms of resources used. In clinical care, the most important resource is often time, which is often translated into cost. Another important resource is the cognitive burden imposed in achieving a level of effectiveness. Work by Saitwal et al has shown that our core EMR, AHLTA, already places a large cognitive burden on providers (2010). High cognitive task burden can lead to mental fatigue and may impact medical care error rates. Finally, user satisfaction is critical to acceptance of new tool and new clinical process implementation efforts.

Successfully implementing new clinical flow processes with associated IT tools is critically dependent on the perceived usability of the IT tools being implemented. A study of emergency room workers examined human factors connected to attitudes toward using IT systems (Ayatollah et al, 2012). The perceived individual impact of technology, perceived usefulness, computer

experience, and perceived ease of use were all strongly correlated with a positive attitude toward using IT systems. Cork et al showed that there were significant correlations between attributes of computer use, computer knowledge and computer optimism (1998). These studies show that baseline computer use and knowledge levels may need to be tracked since these characteristics might impact BHDP usability.

There are other factors that may influence usability when moving conceptually from a provider level to a higher organizational level. Mohamadoli et al expanded a task-technology fit model previously used to explain user acceptance and detailed a model asserting technology "fit" within an organization can be maximized by examining the user, technology and the organization (2012). The better the fit between these three factors, the better any technology implementation will be. This concept is critical to how BHDP is accepted in a structured Army medical organization aiming to provide enhanced standardization of structure and processes to its BH care mission. This concept also implies that a user's relationship with the Army organization may also impact BHDP acceptance.

Hypotheses. Several hypotheses were generated prior to creating the BHDP usability survey. First, it was hypothesized that various provider characteristics might affect BHDP usability. Some of these characteristics are BH provider type, years of experiences as a BH provider, whether they were active duty or civilian, general level of computer use comfort and years of AHLTA use. It was also hypothesized that as a provider used BHDP more and utilized BHDP in a larger percentage of clinical care, the usability of BHDP would increase for a provider. The

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final hypothesis was that BHDP will impact the ability of providers to execute specific targeted clinical interactions.

METHODS

The BHDP Usability survey protocol (#00009274) was submitted to the OHSU Institutional Review Board (IRB) process as an exempt protocol request. A minimum information data sheet was provided for the informed consent process since the survey was not collecting any unique personal identifying information or clinical data. The initial submission was completed on March 23, 2013, and the approval was granted on April 25, 2013.

The System Usability Scale (SUS) was chosen to measure general usability because it has been used extensively in this area of work during the past 25 years and has been shown to have a reasonable level of validity and reliability (Bangor et al, 2008, and Lewis and Sauro, 2009). In order to minimize confusion about which clinical system was being referenced, the word "system" was changed to "BHDP" throughout the SUS.

In addition to general usability as measured by the SUS, questions were added in order to figure out whether BHDP helped enable specific clinical functions, whether certain BHDP-specific elements were more valued than others and what future functions providers were most interested in having developed in the near future. One of the key aims with building BHDP was to have BHDP perform routine data collection functions which would allow more time for providers to focus on patient-specific elements and to build therapeutic alliance. The end goal was to

figure out whether BHDP helped focus the patient interview. Historically, the data collection in the BH field is heavily focused on patient-reported information in response to provider questioning. This means if providers do not ask questions with the right content, or in the right way, patients might not respond with fully truthful information. Since BHDP solves that problem by asking questions in a standard, research-validated manner, a question was included in the survey to determine if BHDP helped providers identify issues that might have otherwise been missed. Finally, since prior to BHDP there was very limited tracking of standardized BH outcomes within the Army, a question was included to ask whether BHDP helped providers track treatment progress. Providers were asked their level of agreement with each of the major current BHDP functions along a Likert scale ranging from strongly disagree to strongly agree. Also, planned future development efforts were listed for providers to prioritize which items might be most valuable to their clinical efforts.

To evaluate the best way to capture data from this survey, an analysis of various paper, email and web-based methods were considered (Dillman et al, 2009). An estimate was made that 1500-2000 BH providers will be using BHDP at the time of the survey. In detecting a 50/50 split in an answer with +/-5% error and a 95% confidence interval, a population of 1750 providers would necessitate a representative survey respondent size of 315 people (18%). A previous informal web-based information technology needs assessment project with BH providers was conducted in the previous year yielding 250 responses. Therefore, with a more

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formal process and with an application currently in use, this sample size needed was perceived as achievable.

Initially, an attempt was made to build the survey as a web-based instrument using Survey Monkey technology. However, initial testing of the survey revealed some Army hospitals allowed access to this survey website while others did not. Therefore, a search for other web-based survey capabilities revealed that the U.S. Army Public Health Command (USAPHC) had recently established an internal capability to execute web-based surveys within the Army that would work across all hospitals. USAPHC agreed to assist in the re-building of the survey and initial pilot testing was successful.

As of May 1st, 2013, there were 1932 BH providers of various skill levels who had been granted BHDP permissions. Since the BHDP permissions data set included email addresses of each provider in the system, a strategy of direct and indirect email recruitment was pursued. The IRB-approved information sheet for informed consent was placed on the first page of the web-based survey and in the recruitment emails (see Appendix C for a sample of the information sheet and survey). Direct recruitment emails were sent to all BH providers with BHDP provider permissions. Two follow-up direct emails were sent on day nine and sixteen of the survey period. An indirect email process was pursued by sending a recruitment email on day ten to the Army regional BH leaders asking them to encourage their hospital BH leaders to forward the email to their respective BH providers.

SUS scores are calculated by adjusting the raw scores of the ten items for polarity reversal in some of the questions. Each question has a 5 point Likert scale

ranging 1 to 5 with the low end corresponding to low usability and higher numbers

indicating increased usability. Each item's score contribution will range from 0 to 4.

Questions 1, 3, 5, 7, and 9 are calculated by subtracting 1 from the scale position of

the answer. Questions 2, 4, 6, 8 and 10 are calculated by subtracting the scale

position from 5. The 10 items are then summed and multiplied by 2.5 to achieve a

score between 0 and 100.

Frequency distributions were examined for all of the demographic and

military characteristics, computer experience, BHDP usability, and SUS scores. The

mean score and standard deviation (SD) of SUS scores were examined across these

same characteristics. Analysis of variance (ANOVA) was used to examine the

continuous mean SUS score differences across provider and computer use

characteristics. Chi square analysis was used to analyze specific clinical functions of

BHDP (ie. agree/strongly agree BHDP enables specific outcome) across the same

characteristics. Lastly, ANOVA was used to determine whether SUS scores were

related to respondents agreement with each specific clinical function of BHDP. All

data analyses were performed using SAS 9.2 (Cary, NC).

RESULTS

Survey Execution Characteristics. On May 6th, 2013, the BHDP Usability survey website link was sent out by email to 1932 BH providers with BHDP permissions and 1871 emails were successfully delivered (96.8%). 23 emails from the undeliverable list were later successfully delivered to alternate email addresses for those providers. At the end of the survey period, 552 (29.4%) providers had started the survey and 464 (24.7%) completed the survey. The analyses presented were performed on the 464 completed surveys, although some items in these completed surveys are missing.

Demographic Characteristics (see Table 1). Overall, 24.1% of the respondents were active-duty providers and 74.3% were civil service or civilian contractor providers. 36 percent of the providers identified themselves as psychologists or psychiatrists. Social workers accounted for 28.7% of the sample and 1.9% were marriage-family therapists. Nurse practitioners and BH technicians accounted for 8.2% and 16.2% of respondents, respectively. Over 20% of all providers completed their BH training within the last two years. Within this group, 31% were BH technicians (mostly active-duty enlisted personnel with special training in BH assessment) and 21% were psychologists. Forty-eight percent of this

Table 1. Demographic Characteristics of BH Usability Survey Respondents (n=464)		
	n	%
Primary BH Role**		
Active Duty	112	24.1
Civilian-civil service (GS,NSPS)	292	62.9
Civilian-contractor	53	11.4
Reservist	0	
National Guard	0	
Other	7	1.5
BH Provider Type*		
Social Worker	133	28.7
Psychologist	116	25.0
Psychiatrist	51	11.0
Marriage/Family Therapist	9	1.9
Licensed Professional Counselor	6	1.3
Nurse Practioner/Adv Pract Nurse	38	8.2
Behavioral Health Technician (68X, SSA)	75	16.2
Other	36	7.8
Time Since BH Training Complete (years)		
< 2	98	21.1
2 - 4	59	12.7
5 - 7	54	11.6
8 - 10	37	8.0
11 +	210	45.3
Missing	6	1.3

group were active-duty and the rest were civilian personnel. Another 45.3% of the survey sample are more than 11 years beyond their initial training.

Computer Use Characteristics (see Table 2). Only 14.4% of the providers described less than 2 years of EMR use (AHLTA or other military medical systems) while 49.6% reported using the EMR for 6 or more years. Despite instructions in the recruitment email and on the first page of the survey for respondents not to complete the survey if they have not used BHDP at all, 16% of them still reported they had not used BHDP. Due to the nature of a continuing roll-out process for BHDP across Army clinics, only 15.5% of respondents stated use of 7 months or more. In addition, 62.8% reported at least 3 or more month of BHDP use. Nearly 46% reported using BHDP for less than 25% of their clinical work whereas 39.4% use BHDP for at least 50% of their clinical work. In an attempt to determine whether a provider's general comfort level with using computers for routine tasks (e.g., website visiting, email, word processing) affected any of the outcomes, a question in the survey asked providers about their general comfort in executing these tasks. 75% reported feeling comfortable or very comfortable

Table 2. Computer experience and comfort of BH Usability Survey Respondents (n=464)	n	%
Electronic Health Records Experience (years)		
< 2	67	14.4
2 - 3	64	13.8
4 - 5	100	21.6
6 +	230	49.6
Missing	3	0.7
BHDP Use (Months)		
Never	74	16.0
< 1	31	6.7
1 - 2	67	14.4
3 - 4	119	25.7
5 - 6	100	21.6
7 +	72	15.5
Missing	1	0.2
Clinical Care Use of BHDP (Percent)		
0 - 24	213	45.9
25 - 49	63	13.6
50 - 74	53	11.4
75 - 100	130	28.0
Missing	5	1.1
Comfort Using Computer for routine tasks		
Very Comfortable/Comfortable	348	75.0
Neutral	17	3.7
Very Uncomfortable/Uncomfortable	93	20.0
Missing	6	1.3

executing these tasks. Twenty percent of providers described being uncomfortable or very uncomfortable with performing daily computer tasks.

System Usability Scale (see Table 3). Of the 464 providers completing the survey, 407 completed all SUS questions. Two providers answered some, but not all questions, and were excluded from all analyses involving the SUS. Table 3 summarizes the 5-point Likert scale items into 3 categories: a level of disagreement, a neutral stance, or a level of agreement with SUS anchor statements. Some of the questions have reverse polarity from each other. The overall average SUS score was 53.7, with a standard deviation of 22.1 and median of 52.5. Sixty three percent of respondents stated some level of agreement or neutrality with the statement, "I think I would like to use BHDP frequently." Sixty-one percent of the respondents either agreed or were neutral about the statement, "I found the BHDP was easy to use." 59.3% disagreed with needing a technical person to be able to use BHDP. 46.3% readily agreed with the statement that most people would learn to use BHDP quickly. Another 22.2% were neutral about the statement. Only 15.7% of providers disagreed with the statement, "I felt very confident using BHDP."

Table 3. Distribution of System Usability Scale Items								
	Strongly Disagree/disagree		Neutral		Agree/Strongly Agree		Missing/NA	
	n	%	n	%	n	%	n	%
I think I would like to use BHDP frequently	135	29.1	93	20.0	199	42.9	37	8.0
I found the BHDP unnecessarily complex	177	38.2	105	22.6	129	27.8	53	11.4
I thought the BHDP was easy to use	116	25.0	97	20.9	198	42.7	53	11.4
I think that I would need the support of a technical person to be able to use BHDP	275	59.3	72	15.5	70	15.1	47	10.1
I found the various functions in BHDP were well integrated	110	23.7	137	29.5	155	33.4	62	13.4
I thought there was too much inconsistency in BHDP	159	34.3	129	27.8	107	23.1	69	15.0
I would imagine that most people would learn to use BHDP very quickly	101	21.8	103	22.2	215	46.3	45	9.7
I found BHDP very cumbersome to use	152	32.8	96	20.7	159	34.3	57	12.3
I felt very confident using BHDP	73	15.7	124	26.7	202	42.5	65	14.0
I needed to learn a lot of things before I could get going with BHDP	241	51.9	92	19.8	86	18.5	45	9.7
	mean	std dev	median	mode	min	max	skewness	
Total System Usability Scale Score (n=407)	53.7	22.1	52.5	50.0	0.0	100	-0.3	

SUS Score Comparisons with Demographics and Computer Use

Characteristics (see Tables 4-5). Utilizing an ANOVA to examine whether SUS scores were mediated by provider demographics, no significant findings were found (I.e., p-value less than 0.05). The p values for the test statistic for primary provider cohort, provider role, time since BH training completed, and years of EMR use were 0.41, 0.11, 0.71, and 0.91, respectively. However, months of BHDP use, percent of clinical care utilizing BHDP and computer use comfort all did have significant p values with analysis of variance investigation. These p values were < 0.0001, <0.001, and 0.02, respectively.

Table 4. Mean SUS BHSP Scores by Demographic Characteristics (n=407)			ANOVA
	mean	std dev	p
Primary BH Role			
Active Duty	55.8	22.3	
Civilian-civil service (GS,NSPS)	53.0	22.0	0.41
Civilian-contractor	54.7	21.3	
Other	42.1	33.4	
BH Provider Type			
Social Worker	55.1	22.5	
Psychologist	55.1	23.6	
Psychiatrist	50.4	20.6	
Marriage/Family Therapist	60.6	24.4	0.11
Licensed Professional Counselor	54.5	13.3	
Nurse Practioner/Adv Pract Nurse	46.9	22.5	
Behavioral Health Technician (68X, SSA)	57.4	19.5	
Other	45.0	21.3	
Time Since BH Training Complete (years)			
< 2	54.5	22.2	
2 - 4	55.9	22.1	
5 - 7	49.8	21.9	0.71
8 - 10	54.5	20.3	
11 +	53.5	22.7	

Table 5. Mean SUS BHSP Scores by Computer Experience and Comfort (n=407)			ANOVA
	mean	std dev	p
Electronic Health Records Experience (years)			
< 2	52.8	20.1	
2 -3	53.4	21	0.91
4 - 5	52.5	23.3	
6 +	54.4	22.6	
BHDP Use (Months)			
Never	30.2	22.6	
< 1	52.7	21.9	
1 - 2	57.3	20.8	<0.0001
3 - 4	54	19.2	
5 - 6	55.1	18.1	
7 +	63.8	22.7	
Clinical Care Use of BHDP (Percent)			
0 - 24	45.7	20.8	
25 - 49	53.5	21.3	<0.001
50 - 74	61.3	18.4	
75 - 100	62.6	21.5	
Comfort Using Computer for routine tasks			
Very Uncomfortable/Uncomfortable	50.4		
Neutral	40.4		0.02
Very Comfortable/Comfortable	55.2		

BHDP-Specific Usability Elements (see Table 6). When examining overall response rates for BHDP-specific usability elements, there was a spread of

responses. Respondents both disagreed (34.4%) and agreed (33.3%) in near equal

numbers about whether BHDP helped focus the initial patient interview. A similar

dichotomy exists with the question about whether potentially missed interview

Table 6. BHDP Usabilty Survey Respondent Patient and Encounters Usages (n=433)	Strongly Disagree/Disagree		Neutral		Agree/Strongly Agree	
	n	%	n	%	n	%
BHDP helps me focus my initial patient interview	149	34.4	78	18.0	144	33.3
BHDP helps me identify treatment issues that I might have missed without it	130	30.0	88	20.3	157	36.3
BHDP helps me track patient treatment progress	83	19.2	87	20.1	199	46.0
I would like the clinic to keep using the BHDP	125	28.9	97	22.4	166	38.4

items were identified with BHDP, with 30.0% reporting disagreement with the

statement and 36.3% agreeing. Forty-six percent agree that BHDP helps them track

patient treatment progress while only 19.2% disagree with the statement. Only 29%

of providers surveyed disagreed with continued BHDP use. 60.8% of providers

either agreed their clinic should continue to use BHDP (38.4%) or had a neutral

stance (22.4%).

BHDP-Specific Usability Elements by Provider Demographics (See Table 7).

BHDP-specific elements responses did not significantly differ whether a provider

was active duty Army or a type of civilian provider. Provider-type did significantly

impact responses for focusing the initial interview, identifying potentially missed

items and tracking treatment progress with p values of <0.0001, 0.0002, and 0.0002,

respectively. For example, only 25.0% of psychiatrists agreed that BHDP helped

focus the initial interview while 60.0% of LPCs and 40.2% of social workers agreed

with this statement. Psychiatrists were least likely to agree that potentially missed

items were identified with BHDP (35.4%). A much higher percentage of

psychiatrists, psychologists, social workers and marriage/family therapists

appeared to agree that BHDP helps track treatment progress (47.9%, 54.6%, 54.1%

and 55.6%, respectively). Interestingly, the length of time since a provider had

completed BH training only significantly impacted agreement responses on the

Table 7. BHDP functional use compared across BHDP usability survey respondent demographics (% Agree/Strongly Agree) (n=433)											
	Focus Initial Patient Interview			Identify Otherwise Missed Issues			Track Patient Progress			Desire for Continued BHDP Use		
			Chi-Sq			Chi-Sq			Chi-Sq			Chi-Sq
	n	%	p	n	%	p	n	%	p	n	%	p
Primary BH Role												
Active Duty	38	35.9		44	41.5		54	51.0		45	42.5	
Civilian-civil service (GS,NSPS)	86	32.0	0.93	89	33.1	0.59	117	43.5	0.73	95	35.3	0.84
Civilian-contractor	18	34.6		22	42.3		27	51.9		23	44.2	
Other	2	33.3		2	33.3		1	16.7		3	50.0	
BH Provider Type												
Social Worker	49	40.2		54	44.3		66	54.1		49	40.2	
Psychologist	39	36.1		45	41.7		59	54.6		45	41.7	
Psychiatrist	12	25.0		17	35.4		23	47.9		18	37.5	
Marriage/Family Therapist	4	44.4	<0.0001	5	55.6	0.0002	5	55.6	0.0002	5	55.6	0.32
Licensed Professional Counselor	3	60.0		3	60.0		2	40.0		2	40.0	
Nurse Practioner/Adv Pract Nurse	7	18.9		8	21.6		12	32.4		10	27.0	
Behavioral Health Technician (68X, SSA)	27	38.0		23	32.4		27	38.0		29	40.9	
Other	3	9.1		2	6.1		5	15.2		8	24.2	
Time Since BH Training Complete (years)												
< 2	24	26.4		31	34.1		36	39.6		34	37.4	
2 - 4	22	40.7		22	40.7		32	59.3		24	44.4	
5 - 7	17	34.7	0.08	15	30.6	0.2	19	38.8	0.01	14	28.6	0.33
8 - 10	12	32.4		13	35.1		17	46.0		15	40.5	
11 +	68	34.5		75	38.1		94	47.7		77	39.1	

BHDP helping with tracking treatment progress question (p = 0.01), with a trend

toward increasing experience leading to increased agreement.

BHDP-Specific Usability Elements by Computer Experience (see Table 8).

The length of experience with EMRs did not impact responses on any of the four

BHDP-specific usability questions. The months of BHDP use did significantly impact

the responses on whether BHDP helped focus the initial interview. 57.8% of those

with 7 months or more use of BHDP agree that BHDP helps focus the initial

interview while only 25.8% of those with less than a month of BHDP use agree with

this statement. Months of BHDP use did not significantly impact the other BHDP-

specific elements questions at this time. The percentage of clinical care executed

with BHDP use significantly impacted all 4 BHDP-specific usability questions with p

values <0.0001 for each question. Only 18% of those who use BHDP for less than

25% of their clinical care agree with BHDP helping focus the patient interview,

while 52.9% of those using BHDP for 75% or more of their clinical care agree with

Table 8. BHDP functional use compared across BHDP usability survey respondent computer experience/comfort (% Agree/Strongly Agree) (n=433)											
	Focus Initial Patient Interview			Identify Otherwise Missed Issues			Track Patient Progress			Desire for Continued BHDP Use		
			Chi-Sq			Chi-Sq			Chi-Sq			Chi-Sq
	n	%	p	n	%	p	n	%	p	n	%	p
Electronic Health Records Experience												
< 2	21	33.3		23	36.5		20	31.8		23	36.5	
2 - 3	19	32.8	0.57	20	34.5	0.74	29	50.0	0.39	19	32.8	0.63
4 - 5	27	28.7		30	31.9		44	46.8		32	34.0	
6 +	76	35.2		84	38.9		105	48.6		91	42.1	
BHDP Use (Months)*												
Never	EXCLUDED											
< 1	8	25.8		10	32.3		16	51.6		10	32.3	
1 - 2	21	34.4		26	42.6		35	57.4		29	47.5	
3 - 4	39	34.5	0.01	38	33.6	0.22	50	44.3	0.27	45	39.8	0.29
5 - 6	36	39.1		47	51.1		50	54.4		38	41.3	
7 +	39	57.4		34	50.0		45	66.2		40	58.8	
Clinical Care Use of BHDP (Percent)												
0 - 24	36	18.0		47	23.5		58	29.0		47	23.5	
25 - 49	20	33.3	<0.0001	23	38.3	<0.0001	31	51.7	<0.0001	24	40.0	<0.0001
50 - 74	25	49.0		27	52.9		30	58.8		28	54.9	
75 - 100	63	52.9		60	50.4		80	67.2		67	56.3	
Routine Task Computer Use Comfort												
Very Uncomfortable/ Uncomfortable	23	33.3		25	36.8		33	48.5		33	46.5	
Neutral	4	33.3	0.64	3	25.0	0.37	6	50.0	0.73	3	25.0	0.58
Very Comfortable/ Comfortable	115	40.2		128	44.0		159	55.8		128	42.5	

this statement. Likewise, 50.4% of providers using BHDP for more than 75% of their

clinical work agree that BHDP helps identify otherwise missed issues, while only

23.5% of those who use BHDP for less than 25% of their clinical work agree with

this statement. Of most importance, 67.2% of those who use BHDP for more than

75% of their clinical care report that BHDP helps track patient progress. In

examining those who agreed with the statement about whether their clinic should

continue using BHDP, response rates increase in proportion to BHDP use in clinical

care, ranging from a low of 23.5% for those using BHDP for less than 25% of clinical

care to 56.3% for those using BHDP for more than 75% of clinical care.

SUS Scores and BHDP-Specific Usability Elements (see Table 9). One way to

know whether system usability has any applicability to BHDP is to examine the

relationship between SUS scores and provider agreement with core desired clinical

Table 9. Mean SUS BHSP Scores by specific functions of BHDP			ANOVA
	mean	std dev	p
BHDP helps me focus my initial patient interview			
Strongly Disagree/Disagree	45.0	18.2	
Neutral	54.4	16.3	<0.0001
Agree/Strongly Agree	68.5	16.8	
BHDP helps me identify treatment issues that I might have missed without it			
Strongly Disagree/Disagree	45.0	19.2	
Neutral	54.9	17.3	<0.0001
Agree/Strongly Agree	65.7	17.3	
BHDP helps me track patient treatment progress			
Strongly Disagree/Disagree	39.1	18.2	
Neutral	51.1	15.9	<0.0001
Agree/Strongly Agree	65.1	16.9	
I would like the clinic to keep using the BHDP			
Strongly Disagree/Disagree	38.8	15.6	
Neutral	51.7	14.8	<0.0001
Agree/Strongly Agree	70.1	16.3	

functionality of BHDP. Utilizing an ANOVA between each BHDP clinical functional

question and the SUS score for each response category grouping, every BHDP-

specific usability question demonstrated a significant relationship with SUS scores

($p < 0.0001$ for all questions). The initial statement about the ability for BHDP to

focus the initial clinical interview had a mean SUS score of 68.5 for those agreeing

with the statement versus a mean SUS score of 45.0 for those disagreeing. Mean SUS

scores for those agreeing and disagreeing with the ability of BHDP to help track

treatment progress ranged from 65.1 to 39.1, respectively. Similar results are also seen for the other BHDP-specific elements questions.

DISCUSSION

The BHDP usability survey results have generated several important insights regarding the first several months of BHDP use. Overall, there appear to be large provider cohorts either in their first four years post training or with more than eleven years post-training. At the extremes, this could present challenges for improving usability of systems. In the younger cohort where they may be more comfortable with computers, there could be a reluctance to give credence to patient self-report metrics and to question the reasons for patient responses resulting in lower perceived utility and usability of BHDP. Those in the older cohort where there might be a lower level of general comfort in using computers, they may be at risk of struggling with an additional technology perceived as increasing the complexity of the care process, thus potentially reducing perceived usability.

Since the Army is only in the initial stages of deploying BHDP, clinic sites are only beginning to fully integrate BHDP into routine clinical business flows in clinics. This is demonstrated with nearly half of respondents reporting using BHDP for less than 25% of their clinical care efforts. Currently, the Army requires BHDP to be used with all routine adult individual BH care. BHDP is not mandated for use yet with pre– and post-deployment BH screening, triage evaluations, group treatments, or within other specialty BH clinics. Also, when implementing BHDP, it is easier to start using the application with new patients entering our care system than with

those already in care. Therefore, clinics often take 3-4 months to fully implement

BHDP within all relevant clinical encounters. Combining this with the fact that

62.8% of providers have used BHDP for only 4 months or less leads to a situation

where most providers are still learning how to incorporate a new process into their

clinical care efforts.

The first hypothesis asking whether BHDP usability, using SUS scores as the

proxy, would vary due to a provider's specialty type, military status, years of

practice post-training, familiarity with other healthcare applications, or general

comfort with using computers, was not substantiated. Of interest, it appears those

reporting being uncomfortable with basic computer use had similar mean SUS

scores as those reporting comfort with basic computer use. This is in contrast to

other literature that reports computer familiarity impacts usability perceptions of

EMRs (Ayatollah et al, 2012 and Moody et al, 2004). There are several potential

explanations for this. First, it could be that BHDP was designed to be simple enough

that basic computer comfort did not significantly impact SUS scores. Second, there

could be other off-setting unrealized confounders that could be impacting what

otherwise would be differential SUS scores. Finally, it could be that comparing

usability of an actual EMR-like product is different than measuring general

perceptions as was done in the other referenced literature.

By contrast, consistent with the second hypothesis, SUS scores did vary

based on total months of BHDP use and percentage of BHDP use in clinical care.

These two questions are likely related to the previously stated concerns that it takes

3-4 months for a clinical site to fully deploy BHDP and many providers are still in

their first four months of BHDP use. It is encouraging that SUS usability score and BHDP-specific element statement agreements both markedly increase with increased months of BHDP use and with more consistent BHDP use in clinical care efforts. This implies that perceived BHDP usability increases with more use of BHDP and may demonstrate that providers can learn to use BHDP quickly when actually using it in clinical practice. This also fits with idea that BHDP use does represent for many providers a whole new way of conducting BH clinical care. Historically, most BH providers have not been trained in the use of structured clinical outcome metrics and have not had access to consistent tracking tools.

In examining the third hypothesis of whether BHDP use can affect targeted clinical actions, it is difficult to derive meaning from the data. When comparing responses of various specialty types, the varied response levels imply some differing reaction by specific groups of providers. For example, only 25% of psychiatrists agree that BHDP helps focus the initial interview, while 60% of licensed professional counselors (LPCs) agree with this statement. It is possible that since medical doctoral-level psychiatrists have 4+ years of direct clinical BH training and bachelor-trained LPCs might have the equivalent of several months of non-medical BH training in interviewing, that there is more potential for this capability to support LPCs than psychiatrists. Similar findings are suggested in the statement about BHDP's capability to help identify potentially missed items.

Psychologists, social workers and marriage-family therapists appear to value BHDP for patient progress tracking more than other specialty types. This could be due to fact that these specialty types have a higher percentage of their clinical time

spent with patients in psychotherapy appointments. It is in this exact clinical area where treatment progress tracking is expected to bring the most value. Of note, there was also a significant trend for those with more clinical experience to value BHDP treatment progress tracking capability. This could be a cohort effect wherein the specialties above tend to have more clinical experience than other cohorts. Or, it is possible that those with more clinical experience are more aware that it is difficult to accurately determine a patient's progress without tracking data.

With more clinical use of BHDP, there was increased agreement with all of the BHDP-specific usability items and this increased use appeared to have the largest impact on provider responses in this category of BHDP-specific clinical functions. This robust finding demonstrates that familiarity with BHDP in actual clinical care drives increased usability and that BHDP is learnable with routine use. Combined with the similar increase in SUS scores, this adds to the evidence that increased use leads to improved usability. The time period for realizing significant gains is six months or less.

LIMITATIONS and FUTURE PLANS

There are several limitations that need to be considered while evaluating this survey data. First, despite an overall response rate of over 24%, it is possible that certain sub-groups are not adequately represented. Several large installations, including Fort Bliss, TX, and Fort Hood, TX, have not fully implemented BHDP and these facilities could have implementation and clinic business flow challenges not present at smaller bases. Larger bases' data could result in a different pattern of

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reported BHDP usability. Some large bases have started implementation, so providers at these locations may represent the missing locations. Further, some specialties could be over- or under- represented in the sample. Psychiatrists and psychologists typically have the highest workload in Army BH clinics, and therefore, they might be less likely to take the time to complete the survey. Since those who use BHDP for a majority of their clinical care have higher usability responses, this group could be under-represented as it is likely that these same providers are the ones most likely to have a higher workload impairing their ability to have time to complete the survey.

Second, despite initial BHDP implementation efforts, comparisons of BHDP use by providers to counts of BH clinical encounters in AHLTA suggest that there might be up to an additional 40-50% more encounters where BHDP could still be utilized. This lack of full penetration of BHDP use in clinics could impact usability ratings. The data suggests that usability will increase as BHDP is used in a higher percentage of clinical care and providers become used to incorporating BHDP more routinely into care practices. In contrast, we might not be detecting usability concerns that will emerge with more widespread use.

Third, we could have decreased representation from those who are uncomfortable using computers since the survey was conducted using a web-based modality. This potential under-representation might lead to an over-reporting of usability and less detection of problematic areas for those with lower computer comfort. However, those reporting lower computer use comfort had similar SUS scores with those reporting computer use comfort.

Since this usability survey was executed so early in the Army roll-out process, there is likely value in repeating this survey in the next year, especially since a key finding appears to be that increased use of BHDP improves usability. Future surveys will need to examine if this finding persists. Future surveys will also need to look at what factors may be correlated with improved BHDP usability. One important category of questions that may be important to add may be that of clinic implementation factors that improved BHDP adoption locally. Some clinics have implemented slowly over a 3-6 month period while others started everyone at one time. Also, some clinics have appeared to adjust clinic flow processes better than other clinics and this process may also affect BHDP usability perceptions by providers. If resources will allow, a qualitative evaluation effort with semi-structured interviews may be useful in gathering contextual data to add depth to these basic initial findings.

CONCLUSION

The BHDP Usability Survey effort achieved an acceptable response rate of 29%, more than sufficient for achieving an adequate sample size (Dillman). Although overall SUS scores were not high, this usability survey was completed very early in the deployment of an entirely new clinical and business process within Army BH clinics. BHDP usability, as measured by SUS and BHDP-specific elements, significantly increases as providers continue to use BHDP over time and with more consistent use in clinical care provision. Different types of BH providers perceived significantly different levels of utility of BHDP to assist in shaping clinical

interviews, to detect missed items and to track treatment progress. We will continue

our efforts to solicit provider feedback and measure usability as an integral part of

our future feature development process in order to ensure that BHDP continues to

evolve to be a truly useful and provider-driven clinical tool.

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APPENDIX A – PATIENT PORTAL SCREEN VIEWS

Single-Item Type Question

Likert Question Type

Slider Scale Type Question

Multiple questions view for larger screens

APPENDIX B – BHDP PROVIDER PORTAL EXAMPLES

Main Dashboard for a provider to view on a specific patient

Section View of a specific clinical scale showing a chart/graph of past results

Hot Sheet view of clinical scale sections, overall scores, interpretations and high-value items automatically brought to the top of the hot sheet.

BASIS-24: 2.12 - Moderate to High level of general distress reported	9/14/2012

PHQ2 - This section was started but not all questions were answered	9/13/2012

PHQ2: 5 - Depressive Syndrome Possible, see PHQ9. Evaluation indicated	9/14/2012

PHQ9: 15 - Moderate-severe depressive symptoms reported, evaluation indicated	8/23/2012
Question	**Response**
Thoughts that you would be better off dead, or of hurting yourself in some way	Several days

PHQ9 - This section was not administered	9/14/2012

4Q-PTSD: 3 - PTSD possible, see PCL. Evaluation indicated	9/13/2012

PCL-C: 51 - Moderate PTSD symptoms reported. Evaluation indicated	9/13/2012

Patient List view where providers can filter and sort their own patients or those of their clinic for different tracking purposes.

APPENDIX C – BHDP USABILTY SURVEY

(text version shown – actual web-version had improved user interface)

Welcome to the Behavioral Health Data Portal (BHDP) Usability Survey! My name is LTC Mill Brown and our team is very interested in hearing your feedback about the BHDP web application. We are adding new functions every month and want you to have an ongoing voice in shaping this clinical tool. This survey is one method we are using to gather your feedback on the ground level to ensure we are meeting your needs and to inform what items we prioritize in building future functions. You can also give feedback at any time by clicking on the feedback link on the top right of the BHDP website.

Your participation in this survey is completely voluntary and anonymous. No identifying data is being collected in this survey. We collect basic demographic information only to inform us of whether there are issues for specific user sub-groups that need to be addressed. This survey will also be used as part of a project for my masters work at Oregon Health Sciences University. See information sheet below for more details.

This survey should take about 10-15 minutes to complete. Please respond to the questions with your experience with BHDP so far, unless indicated otherwise.

Thank you very much for allowing us to utilize your time to obtain your feedback. We are very dedicated to keeping an open dialogue with providers so that BHDP is a end-user driven capability that truly meets needs of our BH clinics.

Oregon Health Sciences University
Information Sheet
IRB# 00009274
Protocol Approval Date: 25 APR 2013

TITLE: Behavioral Health Data Portal Usability Study

PRINCIPAL INVESTIGATOR: Dr. Joan Ash, MD (503) 494-4540

CO-INVESTIGATOR: LTC Millard Brown, MD (210) 573-8946

PURPOSE:
You have been invited to be in this research study because you are a behavioral health provider in an Army clinic. The purpose of this study is to assess the usability of the Behavioral Health Data Portal and to determine future enhancements needed to improve the software.

PROCEDURES:
To participate in this study, simply click on the survey link provided and complete the questions. The full survey will take about 15 minutes or less to complete. This survey is completely anonymous and no identifying information is collected. If you have any questions regarding this study now or in the future, contact LTC Millard Brown at 210-573-8946 or at millard.brown@us.army.mil.

RISKS:
Although we have made every effort to protect your identity, there is a minimal risk of loss of confidentiality.

BENEFITS:
You may or may not benefit from being in this study. However, by serving as a subject, you may help us learn how to benefit patients in the future.

CONFIDENTIALITY:
In this study we are not receiving any identifiable information about you so there is little chance of breach of confidentiality.

PARTICIPATION:
If you have any questions regarding your rights as a research subject, you may contact the OHSU Research Integrity Office at (503) 494-7887.

You do not have to join this or any research study. If you do join, and later change your mind, you may quit at any time. If you refuse to join or withdraw early from the study, there will be no penalty or loss of any benefits to which you are otherwise entitled.

1. In your primary behavioral health (BH) provider role, what is your duty status?

Active Duty   Reservist
Civilian - civil service (GS or NSPS)   National Guard
Civilian - contractor   Other (please specify)

2. What type of BH provider are you?

Social Worker   Licensed Professional Counselor
Psychologist   Nurse Practioner / Advance Practice Nurse
Psychiatrist   Other (please specify)
Marriage/Family Therapist

3. How long have you worked since completing all of your BH training (internship, residency, practicum)?

Less than 2 years
2 - 4 years
5 - 7 years
8 - 10 years
11 or more years

4. In general, how comfortable are you using your work computer for day-to-day tasks, like email, web browser use, Microsoft Office (Word, Excel, PowerPoint, etc.) use?

Very Uncomfortable
Uncomfortable
Neutral
Comfortable
Very Comfortable

5. How many years have you been working with an electronic health record like AHLTA/Vista/others? (include both during and after training)

Less than 2 years
2 - 3 years
4 - 5 years
6 or more years

6. How many months have you been using the Behavioral Health Data Portal (BHDP)?

Never used

Less than 1 month
1 - 2 months
3 - 4 months
5 - 6 months
7 or more months

7. During this [Q6] of BHDP use, what percent of your clinical care includes using the BHDP?

0-24%
25-49%
50-74%
75-100%

8.   This set of questions are from the System Usability Scale. Answer the questions based solely on your experience with the Behavioral Health Data Portal (BHDP). Select how strongly you agree with each statement. Be aware that each question is the reverse polarity of the question before it.

ITEMS DOWN LEFT SIDE OF MATRIX:
I think that I would like to use BHDP frequently
I found the BHDP unnecessarily complex
I thought BHDP was easy to use
I think that I would need the support of a technical person to be able to use BHDP
I found the various functions in BHDP were well integrated
I thought there was too much inconsistency in BHDP
I would imagine that most people would learn to use BHDP very quickly
I found BHDP very cumbersome to use
I felt very confident using BHDP
I needed to learn a lot of things before I could get going with BHDP

ANSWER CHOICES ACROSS TOP OF MATRIX
1 - Strongly Disagree
2
3
4
5 - Strongly   Agree
N/A

9. These are additional BHDP Usability questions. Please select how strongly you agree with each statement. 1 = strongly disagree. 5 = strongly agree.

ITEMS DOWN LEFT SIDE OF MATRIX:
BHDP helps me focus my initial patient interview
BHDP helps me identify treatment issues that I might have missed without it
BHDP helps me track patient treatment progress
I would like the clinic to keep using the BHDP

ANSWER CHOICES ACROSS TOP OF MATRIX
1 - Strongly Disagree
2
3
4
5 - Strongly Agree
Don't Know

10. Below are a list of current BHDP functions. For each function, select how important each one is in your clinical work. 5 = very important function for your work. 1 = not at all important for your work.

ITEMS DOWN LEFT SIDE OF MATRIX:
Main patient profile/dashboard
Patient list function
Provider-determined risk level tracking section
Patient-reported risk status section
Care team member listing
ePROFILE view
MEB status view
WTU status view
Hot sheet tab (section headings with only critical items shown in each section)
Today tab (only sections completed today shown)
All tab (shows the latest report for each section ever completed)
Individual section reports (history of past iterations also shown)
Notes tab (preliminary intake note structure with BHDP elements embedded)
Military History tab (deployment history shown)

ANSWER CHOICES ACROSS TOP OF MATRIX
1 - Not at all important function
2
3
4
5 - Very important function
N/A

11. Describe the 3 most important enhancements you would like to see in BHDP.

1. _____
2. _____
3. _____

12. This section asks you to detail how important future functions might be for your clinical work. 1 = not at all important function. 5 = very important function. This will help us determine which items we should focus on building sooner and which functions could wait to later.

ITEMS DOWN LEFT SIDE OF MATRIX:
More types of structured note templates (follow-up notes, school eval notes, etc.)
Other types of clinical scales
Deployment Health Assessment data view (DD2795/2796/2900 forms)
Mental Status Evaluation Letter generation and storage
Algorithms to flag those not likely to improve with treatment
Family Advocacy case status view
Alcohol and Substance Abuse Program case status view
Police arrest blotter report status for Soldiers
RESPECT-Mil data integration and viewing
WTU behavioral health case status data integration
Collecting data from patients between appointments

ANSWER CHOICES ACROSS TOP OF MATRIX
1 - Not at all important function
2
3
4

5 - Very important function
Don't know or N/A

THANK YOU PAGE
Thank you for filling out this BHDP Usability Survey! We truly appreciate your time spent on this and your feedback is critical to ensure that we shape the BHDP into a product that is truly useful in your clinical care practices. A summary of results of this survey are likely to be available by 1 JUN 2013. If you have any questions about this survey, please contact LTC Mill Brown at millard.brown@us.army.mil.