# Applied Clinical Informatics

1

# An Exploratory, Population-Based, Mixed-Methods Program Evaluation of User Satisfaction of Services Provided by a Regional Extension Center (REC)

D. Tang<sup>1</sup>; M. Rutala<sup>2</sup>; C. Ihde<sup>2</sup>; A. Bills<sup>2</sup>; L. Mollon<sup>3</sup>; T. Warholak<sup>3</sup>

<sup>1</sup>The University of Arizona College of Pharmacy, Tucson, Arizona, United States; <sup>2</sup>Arizona Health-e Connection, Phoenix, Arizona, United States; <sup>3</sup>The University of Arizona College of Pharmacy, Tucson, Arizona, United States

## Keywords

Health information technology, user satisfaction, mixed-methods study, regional extension center, meaningful use

#### Summary

**Objectives**: To evaluate user satisfaction among practices receiving services provided by the Arizona Regional Extension Center (REC).

**Methods:** This program evaluation utilized a mixed-methods approach including: 1) a mail-based survey targeting all 489 REC member practices; and 2) a series of telephone-based focus groups using a convenience sample of rural and urban REC member practices. Targeted respondents were key contacts who handle interactions with the REC at each practice. Program evaluators at the University of Arizona and experts at Arizona Health-e Connection (AzHeC) created the questionnaires, focus group script, participant invitation and follow up documents via a collaborative process. Regression and Rasch analyses were used to identify key factors associated with satisfaction with REC and to assess questionnaire validity, respectively.

**Results:** Responses from both the focus groups and survey revealed that most of the respondents were satisfied with the current services, despite the presence of satisfaction gaps between practices of various characteristics: respondents that were clinicians, practices using web-based electronic health record systems (EHRs), and practices that had achieved Stage 1 Meaningful Use had a higher level of satisfaction compared with their respective counterparts. Focus group participants provided suggestions for improving REC services.

**Conclusions:** Most respondents reported being satisfied with REC services. Specialized representatives may be needed for practices at different stages of Meaningful Use to further improve REC satisfaction in order to facilitate more efficient adoption of EHRs.

#### Correspondence to:

Derek H. Tang College of Pharmacy 1295 N. Martin PO Box 210202 Tucson, AZ 85721 E-Mail: dtang@pharmacy.arizona.edu Appl Clin Inform 2014 ;5: 1–24 DOI: 10.4338/ACI-2013-06-RA-0037 received: June 27, 2013 accepted: November 12, 2013 published: January 8, 2014 Citation: Tang D, Rutala M, Ihde C, Bills A, Mollon L, Warholak T. An exploratory, population-based, mixedmethods program evaluation of user satisfaction of services provided by a regional extension center (REC). Appl Clin Inf 2014; 5: 1–24 http://dx.doi.org/ 10.4338/ACI-2013-06-RA-0037

© Schattauer 2014

# Introduction

Health information technology (HIT) utilization rate has been low, ranging from 10 to 28 percent in various settings prior to 2008 [1]; increasing its adoption can potentially improve health care efficiency, patient safety, and quality of care [1–5]. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 was established to financially support the adoption of HIT among clinicians and hospitals. The act purported to allocate a maximum of \$44,000-\$63,750 per eligible practicing clinician and \$2-\$20 million per hospital that qualifies as a "meaningful" user of electronic health records (EHRs) [6, 7]. The Centers for Medicare & Medicaid Services (CMS) defined Meaningful Use based on a series of core and selective objective measures that health care providers should achieve [8]. Core objectives span from electronically recording basic patient demographic and clinical data, employing particular clinical decision support tools, to providing patients a clinical summary of their visit [8]. Prior to the enactment of HITECH, Hogan and colleagues identified that between 75 and 85 percent of clinicians using EHRs had achieved some of the proposed Meaningful Use objectives [9].

To assist practices progressing towards achieving Meaningful Use, sixty-two regional extension centers (RECs) covering the majority of the US were funded by the Office of the National Coordinator for Health Information Technology (ONC) [10]. The major responsibilities and services of RECs, including the Arizona's Regional Extension Center (the REC), led by Arizona Health-e Connection (AzHeC), are to help health care providers (primarily priority primary care providers [PPCPs], critical access hospitals [CAHs] and rural hospitals [RHs]) develop a plan to select and/or implement EHRs and to eventually achieve Meaningful Use of the system. The REC serves the entire state of Arizona's population of 8.1 million lives, served by 16,100 providers across all specialties and 74 hospitals with 13,026 licensed beds. Arizona is divided into 15 counties, and nearly 80% of all Arizona residents live in either Maricopa County (which includes the city of Phoenix) or Pima County (which includes the city of Tucson) even though the two counties make up only 16% of Arizona's total land mass. Type of assistance provided by the REC for members has included in-person, virtual, or via phone: in-person visits include group meetings and planning sessions, individual provider specialized training and generalized support staff instruction; virtual sessions were held to present informational and training sessions; phone meetings were held for follow-up conversations, progress reports and general question-and-answer sessions between in-person visits. The internal REC staff consists of:

- REC Director, responsible for oversight of policies and procedures, grant compliance and reporting, membership services and satisfaction, grant subrecipient and staff management, goal attainment and sustainability;
- Provider Success Coordinators, responsible for membership recruitment and retention, incoming member requests for information and out-bound member communication;
- Customer Relationship Management (CRM) System Lead, responsible for CRM system management and daily, monthly, quarterly, and ad-hoc reporting;
- Marketing and Communication support for website management, newsletter and alert publication, and event-planning and coordination; and
- Financial and Human Resource management, including grant-related administration and reporting.

REC services are essential because they help clinicians fulfill newly established federal regulations (i.e., HITECH) in which incentive payments are provided to clinicians if Meaningful Use of EHR is achieved [8]. These services not only help REC members avoid a penalty that will be imposed upon clinicians who have not achieved Meaningful Use of their EHR by 2015 [8], but also indirectly contributes to greater adoption of HIT, leading to more time-efficient and comprehensive record and extraction of patient health information, and ultimately better patient care. To the authors' knowledge, there have been no studies published in the peer-reviewed literature estimating user satisfaction with REC services. Evaluations of user satisfaction can help improve REC services and may in turn improve and facilitate HIT and the efficiency and effectiveness of practices to achieve Meaningful Use of EHRs, and ultimately improve patient health and safety. Thus, the purpose of this mixed-

method program evaluation (i.e., using a combination of qualitative and quantitative methods) is to assess user-satisfaction of REC members.

# **Methods**

This program evaluation utilized mixed-methods comprised of a mail-based survey targeting all 489 medical practices identified by the REC as members, and a series of telephone-based focus groups using a convenience sample of rural and urban REC member practices. Targeted composition for each focus group included:

- 1. 10 to 12 participants;
- 2. two representatives from each of three practice sizes, based upon number of providers in practice: 1–3 providers, 4–6 providers and 7-10 providers; and
- 3. approximately one-third representatives from rural and two-third from urban practices.

Telephone-based in lieu of in-person focus groups were implemented to maximize participation rate and lessen the burden of time off work and travel. The focus group script and user satisfaction questionnaire development was completed by project investigators at the University of Arizona and included input from experts at AzHeC and Health Services Advisory Group (HSAG). AzHeC personnel made invitation calls and sent invitation emails for focus group participation. Focus groups lasting between 30 to 60 minutes were conducted by University of Arizona investigators. Invitation and follow-up of survey participants were managed by AzHeC personnel, whereas focus-group and survey data analysis were completed by the University of Arizona investigators. This investigation was a program evaluation, and thus did not require University of Arizona Institutional Review Board (IRB) review as per federal regulations and University guidance. A copy of the questionnaire and focus group script can be found in the online supplementary files ▶ Appendix A and ▶ Appendix B, respectively.

Regarding the survey, an invitation to respond, the satisfaction questionnaire, and two subsequent reminders (if applicable) were mailed to the designated professional who handles all or the majority of interactions with the REC at each member practice. A power analysis assuming a 5 percent margin of error, a 95 percent confidence level, and a 50% response distribution estimated that at least 216 responses were required to generalize program evaluation results to the population [11]. The level of recall bias can be positively correlated to the time since the practice has discontinued REC services. When time since discontinuation is long, recall bias needs to be addressed and cannot be neglected [12]. Thus, analyses of user perceptions were based upon practices that reported currently receiving REC services to prevent recall bias. A series of sensitivity analysis was also conducted to assess whether response distribution across items were comparable between all respondents who were "currently receiving REC services" and those who have "previously received but not currently receiving REC services." It is important to note that these sensitivity analyses were preliminary, as the questionnaire was originally designed to derive satisfaction level from those who were "currently receiving services" and asked all other respondents to skip to the very end of the questionnaire ( Appendix A); the analyses were based on respondents who did not follow the instructions and provided responses. To explore potential factors influencing user satisfaction, distributions of survey responses were compared between the following practice subgroups using Wilcoxon rank sum test for dichotomous subgroups and non-parametric trend test for subgroups comprising ordinal categories: small ( $n_{physician} = 1$ ) vs. medium ( $n_{physician} = 2-4$ ) vs. large ( $n_{physician} \ge 5$ ) practices; practices located within urban vs. rural counties (as defined by the Arizona Rural Health Assessment) [13]; respondents that were clinicians vs. their counterpart; practices that had vs. had not achieved Meaningful Use; practices using web-based EHR vs. their counterpart; and practices using eClinical-Works as their vendor vs. all other practices (eClinicalWorks was chosen because it was used by the largest number of practices). Multivariate logistic or ordinary least squares (OLS) linear regression models were constructed to explore predictors of:

1. overall satisfaction;

2. perceived helpfulness of REC on assisting practices towards achieving Meaningful Use; and

© Schattauer 2014 D. Tang et al.: Exploratory, population-based, mixed-methods program evaluation of user satisfaction of services provided by REC.

3. Rasch composite scores for the 11 items in section II part 1, 9 items in section II part 2, and 6 items in section III part 1.

Rasch composite scores were calculated from responses aggregated from a theoretically unidimensional set of items (e.g., the 11 items in section II part 1 or the 9 items in section II part 2) for each respondent to indicate an overall level of perception pertaining to a construct (e.g., agreement or satisfaction). Model validity was evaluated using:

- 1. variance inflation factor (VIF) to detect for multicollinearity (recommended value  $\leq 10$ ) [14];
- 2. link test to detect whether critical variables were omitted (recommended hat-square p-value>0.05); and
- 3. Hosmer-Lemeshow goodness-of-fit test (recommended p-value>0.05) [15] to evaluate overall model fit.

The normality and homoscedasticity assumptions were additionally verified for linear regression models using normal probability plots (face validity required) and the Cook-Weisberg test for heteroskedasticity (recommended p-value>0.05), respectively. An a priori significance level was set at 0.05 for this study (i.e., p<0.05 denotes statistical significance).

As is usual practice in survey analysis, lateness of response was used as a proxy for non-responders in this program evaluation [16]. The theory is that late responders reply due to pressure from repeated requests for replies (in this case three waves of the questionnaire were sent to non-responders). Without this pressure, the late responders would be less likely to reply and therefore they would be more like the non-responders than the early responders. Specifically, non-response bias was evaluated by constructing univariate regression models using number of days to respond as the independent variable and the above-mentioned practice/respondent subgroups as the dependent variable [16]. Non-response bias was deemed negligible if the statistical relationship between the independent and dependent variable results in a p-value greater than 0.05.

To preliminarily assess the content and construct validity of the survey questionnaire, Rasch rating scale models were respectively constructed for the following key item sets to identify item irrelevant variance and construct under-representation: 11 items in section II part 1, 9 items in section II part 2 (i.e., excluding the rural practice-only item), and 6 items in section III part 1. In terms of item irrelevant variance, the assessment of item, scale, and person fit followed the guidelines recommended by Linacre et al. [17]: the distribution of observed count should be unimodal; average measures and step difficulty measures should incrementally increase by response category; infit and outfit mean-square values should ideally range between 0.6 and 1.4; and measure-category coherence for all response options should be greater than 40 percent. In terms of construct under-representation, step difficulty between adjacent response options was examined: differences in step difficulty should range between 1.4 and 5 logits. Furthermore, observed count should at least reach 10 for each response option. Rasch analysis was conducted with WINSTEPS version 3.73 (Chicago, IL). Reliability was assessed by computing Cronbach's alpha using the aforementioned three sets of items. These validation analyses demonstrated high reliability (alpha  $\ge 0.93$ ) and content and construct validity, with a few indications for areas of improvement, including one item that demonstrated construct irrelevance (item #7 in section II part 1), and construct under-representation detected between the response options "Agree" and "Strongly Agree".

Keyform maps pertain to Rasch analysis outputs that graphically rank the likelihood of a sample to endorse individual items pertaining to a set of questions. The level of difficulty to endorse individual items for the three sets of questions was graphically ranked using keyform maps.

Regarding the focus groups, the process was audio-taped and notes were taken during the focus groups. Qualitative coding was performed using the notes to summarize main themes identified during the focus groups; the procedures delineated by Richard et al. were followed, including:

- 1. descriptive coding: categorize respondents/practices based on their characteristics;
- 2. topic coding: assign responses to specific topics;
- 3. analytical coding: responses are summarized and evaluated to obtain general themes or patterns; and
- 4. post coding: quantify or statistically analyze responses, topics, or themes generated during the process of topic or analytical coding [18].
- © Schattauer 2014 D. Tang et al.: Exploratory, population-based, mixed-methods program evaluation of user satisfaction of services provided by REC.

TLW and DHT conducted the focus group interviews; LM transcribed the video record to paper; DHT and TLW conducted the coding process. Discrepancies between theme identification were resolved by discussions.

# Results

## Mail-based survey

A total of 282 participants provided responses to the mail-based questionnaires, yielding an overall response rate of 57.7 percent (of 489 REC practices). Among these practices, 215 and 44 practices were "currently receiving services" and "has previously received but not currently receiving services" from the REC. Table 1 depicts the distribution of the selected practice characteristics. The majority of respondents were practice or office managers (n = 123, 57%). In addition, the bulk of their affiliated practices were located in urban counties (n = 153, 71%) and were using client/server-based EHR (n = 134, 62%). The most prevalent primary EHR vendor used by the responding practices was eClinicalWorks (n = 41, 19%).

Non-response bias was not evident: univariate regression models revealed that number of days to respond was not affiliated with the respondent. However, one additional day to respond was associated with a 3 percent decreased odds that the practice had achieved Meaningful Use (p<0.01).

Table 2, ▶ Table 3 and ▶ Table 4 describe the relationship between practice/respondent characteristics and variables pertaining to REC service satisfaction or the perceived value of REC services.
Table 5 describes the Rasch composite scores across key items within the questionnaire, while
Table 6 presents the multivariate model results. Overall, the majority of respondents reported positive opinions of REC services. Nevertheless, perceptions varied across subgroups for certain components.

Specifically, respondents from practices that achieved Meaningful Use expressed significantly stronger agreement (p<0.05) compared with their counterpart in the following items: "The education provided by the REC team was directly applicable to our practices daily work," "The REC program has helped our practice progress toward Meaningful Use," "The REC team was knowledgeable about the CMS incentive program eligibility criteria," and "The REC team was knowledgeable about how the Meaningful Use criteria apply to our practice." ( $\blacktriangleright$  Table 2) These respondents were also significantly more satisfied with "the REC's issue resolution" ( $\blacktriangleright$  Table 3), perceived greater helpfulness in terms of their Direct Technical Assistance Provider's ability to "contribute to [their] ability to meeting Meaningful Use criteria" ( $\blacktriangleright$  Table 4), and had higher Rasch level of agreement scores ( $\triangleright$  Table 5) (p<0.05). In the multivariate analysis controlling for confounders, practices achieving Meaningful Use still demonstrated significantly greater agreement in terms of REC's helping their practices "progress toward Meaningful Use" (odds ratio [OR] = 1.82, 95% confidence interval [CI] = 1.01-3.29) and higher Rasch level of agreement scores (mean difference = 1.23, 95%CI = 0.21-2.26) ( $\triangleright$  Table 6).

As compared with non-clinicians, clinicians had significantly higher agreement on whether "the REC program has helped our practice progress toward Meaningful Use" and whether "the REC team was knowledgeable about the CMS incentive program eligibility criteria" (p<0.05) ( $\triangleright$  Table 2). After multivariate adjustment, clinicians were found to have greater agreement on whether the REC "has helped our practice progress toward Meaningful Use" (OR = 1.82, 95%CI = 1.01–3.29) ( $\triangleright$  Table 6).

Web-based EHR users had significantly greater satisfaction level in the following items compared with their counterpart: "REC's responsiveness to inquiry," "REC's general information provision," "REC's issue resolution," and "my practice's overall satisfaction with the Arizona REC" (p<0.05) ( $\blacktriangleright$  Table 3). Additionally, web-based EHR users had significantly greater satisfaction level in terms of "overall satisfaction with the Arizona REC" in the multivariate analysis (OR = 2.06, 95%CI = 1.02–4.18) ( $\triangleright$  Table 6). These respondents also had significantly greater Rasch level of satisfaction score, with and without confounder adjustment (p<0.05) ( $\triangleright$  Table 5 and  $\triangleright$  Table 6).

There was a significant, inverse trend between practice size and satisfaction level on "the REC's issue resolution" (p<0.05) (▶ Table 3). Rural practices perceived a significantly greater level of benefit compared with urban practices in terms of REC's "advocacy and support for problem resolution"

(p<0.05) (► Table 4). Thus, there were discrepancies of satisfaction across subgroups, with discrepancies existing after multivariate adjustment between practices which achieved vs. had not achieved Meaningful Use, web-based vs. non-web-based users, and clinicians vs. non-clinicians.

All multivariate models demonstrated low risk of multicollinearity (VIF of all independent variables<1.1) and omitting critical model determinants ( $p_{hat-squared}$ >0.05 in model specification test), and good model fit (p>0.05 in Hosmer-Lemeshow goodness-of-fit test). The three linear regression models demonstrated acceptable normality distribution of residuals and homoscedasticity.

Sensitivity analysis, in general (in 14 out of the 28 items), found that respondents who "previously received but not currently receiving REC services had lower satisfaction compared with the overall respondents who were "currently receiving REC services" (▶ Table 7, ▶ Table 8 and ▶ Table 9). Keyform maps of the three sets of question indicated that:

- "The workflow redesign created by the REC team has enhanced our office effectiveness" was the item that was most difficult to agree with (note that the item "The REC program has been important in choosing our EHR" was originally the most difficult-to-agree item, but was dropped out of the Rasch model due to item misfit and thus was not included in the keyform map); whereas "The REC team acted in a professional manner" was the item with which the respondents were most likely to agree;
- 2. "Usability of the REC's member-only website" was the item that the respondents were least satisfied with; on the contrary, "The REC's responsiveness to inquiry" was the item with the highest satisfaction level;
- 3. "Preparation of EHR go-live" had the highest level of perceived benefit; whereas "Advocacy and support for problem resolution" was the item with the lowest level of perceived benefit. A representative example of the keyform maps is shown in ▶ Figure 1.

# **Focus groups**

Five focus groups with urban and rural practices of REC members were conducted, with the number of participants ranging from 4 to 9 people per group (total participants = 35).

# Theme 1: REC dissatisfaction may be attributable to specific representatives, vendors, and/or type of EHR services needed

Participants generally expressed positive opinions of the REC services, with the exception of two practices from Phoenix that had an established EHR before forming a relationship with the REC. Among the unsatisfied practices, factors identified that may have impacted the satisfaction of REC services included:

1. the specific REC representative or vendor to which the practice had been assigned; and

2. the EHR stage that the practice had achieved at the time of initiating affiliation with the REC.

## Theme 2: Experiences with the REC website were limited

From the REC's perspective, the REC website has been thoroughly constructed to include substantial amount of information that assists in REC members attempt to achieve Meaningful Use. However, a common comment from participants was that they had accessed the REC website infrequently if at all (most had not and a few had accessed the site only before establishing a relationship with the REC), and that they had their questions or concerns addressed via REC representatives or newsletters. Amongst those that have accessed the REC website, the richness of information, including REC-related contact information and the ease of navigation were provided as rationale for website use.

# Theme 3: Enhanced information sharing and standardization of REC services may be beneficial to increase overall REC satisfaction

Focus groups were attended by a mixture of participants who had and had not had access to REC email alerts and/or joined REC events. Location and traveling inconvenience were the reasons predominantly mentioned for non-attendance of events. A few participants expressed difficulty distinguishing REC email alerts from e-newsletters.

7

Participants were also asked to provide recommendations for the REC. These recommendations centered around the need to increase information sharing and providing more high-quality standardized services, including:

- 1. establishing a blog, user forum, or a solution database to assist in sharing practice experiences and previously encountered issues associated with Meaningful Use;
- 2. arranging face-to-face meetings with administrators and user groups at a fixed time interval (e.g., annually) to assist practices in developing contacts;
- 3. providing more REC events based for rural communities;
- 4. establishing webinars or videos of REC events for practices outside Phoenix;
- 5. proactively notifying practices of available REC services;
- 6. having a designated personnel who would be more able to work with practices that are already further along the path to Meaningful Use upon initiation of REC services;
- 7. assisting in practices with patient-centered medical home (PCMH);
- 8. constructing a table of contents for REC newsletters;
- 9. sending email alerts to practices regarding deadlines; and
- 10.proactively assisting practices in secure data exchange.

# Discussion

In this program evaluation, most survey respondents and focus group participants were satisfied with the services provided by the REC. However, statistically significant discrepancies independently existed between participants who were clinicians and non-clinicians, practices that had and had not achieved Stage 1 Meaningful Use, and practices using web-based versus non-web-based EHRs: clinicians, practices that had achieved Meaningful Use, and using a web-based EHR had significantly higher level of satisfaction compared with their counterparts. Reliability and validity testing of the survey instrument showed that the questionnaire provided excellent reliability and validity; a few items and scales may potentially be revised where construct irrelevance or under-representation took place.

A few focus group participants suggested that the REC provide more in-person interactions and information-sharing between the REC members and personnel. This simply meant that respondents preferred face-to-face interactions when dealing with issues such as EHR implementation. This was especially important to rural practices that were beginning to work toward Stage 1 Meaningful Use. Focus group participants from rural practices expressed a need to provide REC events or webinars for them to participate remotely. Although urban and rural practices did not report differential level of satisfaction, survey respondents from rural counties also perceived a significantly higher level of benefit regarding REC's "advocacy and support for problem resolution" compared with urban practices. These findings indicated that rural practices, although currently a priority of the REC [19], may require additional support towards achieving Meaningful Use.

In comparison to practices that had achieved Stage 1 Meaningful Use, survey respondents from practices that had not yet achieved Meaningful Use perceived less benefit from REC services. Among the focus group participants, there was a sense of accomplishment among practices associated with achieving Meaningful Use and receiving incentives. In fact, a post hoc sensitivity analysis conducted using data from this evaluation suggested that dissatisfaction among practices that have not achieved Meaningful Use may specifically be attributed to the Meaningful Use attestation process. It is possible that attaining milestones or desired end results (e.g. achievement of Meaningful Use) contributed to a somewhat greater satisfaction level of the REC, regardless of the extent of assistance received from the REC.For those who took advantage of the REC services and have achieved that accomplishment, their satisfaction with their own efforts and those of the REC had been reflected in the survey results.

Only two focus group participants who started receiving REC services after they initiated an EHR and were working towards Meaningful Use expressed dissatisfaction with their assigned REC personnel. It was hypothesized that practices that are further down the path towards achieving Meaningful Use such as these may require assistance from personnel with a more sophisticated skill set. To address this concern, the REC is considering assigning REC personnel to members based on the

skills and experience of the REC personnel and the health IT goals and objectives of the REC member practice.

Clinicians may have greater satisfaction because they were overall less exposed to the REC processes, as the office managers are primarily responsible for the interactions with the REC. Achieving a milestone may sufficiently lead the clinician to believe that the REC services are above-standard. It could also be due to the individual vendors or representatives that did exceptionally great work.

The program evaluation findings indicating that web-based EHR users had showed a greater satisfaction as opposed to client-based EHR users, before and after controlling for various practice characteristics may imply that the perceived benefits of web-based EHR systems outweigh the disadvantages in this population. Although the prevalence of web-based EHR appears to be low (e.g., in the current evaluation: 30%; Jamoom et al., 2012: 41% among EHR adopters) [20], a potential trend of transforming from client-based to web-based EHRs had emerged [21]. Traditional client-based EHRs generally provide a faster response time and incur lower maintenance costs but they do require periodically time-consuming onsite software updates [20]. Additionally, the initial cost of implementing client-based EHRs is comparatively greater as compared with web-based EHRs, and has limited off-site access [20]. With stable internet access, web-based EHRs may be substantially more time-efficient to deal with medical encounters as compared to client-based EHRs by saving time from upgrading/updating the software and having access to larger patient record databases, leading to improved patient health outcomes. Approximately 90 % of physicians had access to internet in their practice environment during 2009 and 2011 [22]. As the adoption of EHR and HIE systems increase coupled with the improvement and increased accessibility of internet access, the predominant usage may gradually shift from client-based to web-based EHRs.

Sensitivity analysis comparing item responses between practices that were currently receiving and had received but not currently receiving REC services showed that satisfaction level was generally lower in those that discontinued. This finding can be partially attributable to recall bias [23, 24], as comparatively more adverse as opposed to satisfactory experiences are more likely to be recalled. In addition, more practices that had used but were not currently receiving services had achieved Meaningful Use (64 % vs. 47 %) compared with those that were receiving services. Overall level of item non-response, due to the questionnaire design, was also greater in previous users. These practices may have discontinued REC services due to fulfillment of final Meaningful Use goal, and less likely responded to the questionnaire. Although it would not be possible to entirely eliminate recall bias, one future approach can be to inquire the reasons of service discontinuation and analyze the data by time since discontinuation.

The current program evaluation was subjected to the following limitations. First, results generated from the focus groups may suffer from limited generalizability due to utilizing a small sample size of a convenient sample and applying subjective judgments [25]. However, qualitative studies may be more applicable to local settings than survey results [25]. Thus, both quantitative (i.e., survey) and qualitative (i.e., focus groups) components were incorporated into this evaluation. Second, the nature of the current evaluation was hypothesis generating. The data collected were cross-sectional with no temporal differences between the independent and dependent variables. Thus, the associations found in this evaluation may not translate to casual relationships. Furthermore, factors not accounted for in the regression models such as respondent age, gender, time since initiating REC services, type of practice [22], and the assigned REC representatives may affect the relationships between respondent/practice characteristics and satisfaction levels considered in this program evaluation. While this study aimed to measure satisfaction on REC services, it is important to note that the satisfaction may not be wholly attributable to the services themselves, but also to whether several outcomes were achieved (e.g., whether the practices achieved Meaningful Use). Based on the findings of this study, the following has been planned and/or implemented:

- The REC is considering the creation of a solution database as part of plans to overhaul and update the website. In addition, the REC is considering a blog or user forum to facilitate sharing practice experiences and previously encountered issues and a table of contents for newsletters to facilitate location of specific topics and relevant issues.
- The REC has partnered with the University of Arizona Center for Rural Health to co-sponsor events to identify challenges, resources, and current work efforts to help critical access hospitals (CAHs), rural hospitals (RHs) and associated rural practices prepare for the ICD-10 transition.

© Schattauer 2014

- In conjunction with the University of Arizona Center for Rural Health plans are to conduct a brief survey among rural providers to identify challenges that exist in meeting MU Stage I requirements with special focus on quality reporting. The REC plans include organizing a webinar(s) with CAH/RH and rural practice staff to review and mitigate the identified challenges and barriers.
- Based upon the participants' suggestions, the REC has provided training for field staff in patient centered medical home (PCMH) knowledge and certification, Health Level Seven International (HL7) training and certification, and Privacy and Security of Health Information training as it relates to requirements of Stage 1 of Meaningful Use.
- The REC has reallocated more experienced staff to work with complex member organizations including underserved organization such as Community Health Centers, Federally Qualified Health Center (FQHC), Rural Health Clinics and other settings that predominantly serve uninsured, underinsured and medically underserved population. In addition, more field staff on-site time has been allocated to practices that have not achieved Stage 1 Meaningful Use.
- The REC now sends alerts to members regarding time sensitive and critical information such as Center for Medicare and Medicaid deadlines, Stage 1 Meaningful Use information announcements and other pertinent and relative news.

# Conclusions

Responses from both the focus groups and survey revealed that most of the respondents were satisfied with the current services. Clinicians, web-based EHR users, and Meaningful Use achievers may be more satisfied to REC services due to relative convenience of the system itself or achievement of an actual milestone, independent of the services provided. The REC may utilize the program evaluation findings to identify underlying reasons for satisfaction gaps across practices of various characteristics and to improve services that had a lower satisfaction level by implementing the recommendations provided by the focus group participants. As the dissatisfaction proportion appeared to be higher in practices that had received but not currently receiving REC services, further identification of key sources of dissatisfaction can target these practices.

#### **Clinical Relevance Statement**

Satisfaction level of REC members towards REC services may be associated with Meaningful Use adoption. This study used methodologically sound approaches that may potentially improve REC services to ultimately facilitate practice adoption of EHR systems, Meaningful Use, and to fulfill federal regulations and enhance patient safety.

## **Conflict Of Interest**

The University of Arizona investigators (DHT and TW) were partly supported by funding from the Arizona Health-e Connection to conduct this evaluation. MAR and CKI have been employed by the Arizona Health-e Connection. DHT was supported by the pre-doctoral fellowship from the American Foundation for Pharmaceutical Education during the conduct of the study.

## **Protection Of Human And Animal Subjects**

This investigation was a program evaluation, and thus did not require University of Arizona Institutional Review Board (IRB) review as per federal regulations and University guidance.

## Acknowledgements

Preliminary results from the survey portion of this study were presented at the 34<sup>th</sup> Annual Meeting of the Society for Medical Decision Making.





**Fig. 1** Keyform map example: Participant response curve and hierarchical ordering of item difficulty for satisfaction questions

	Applied Clinical Informatics	11

 Table 1
 Demographics of Responding Practices Currently Receiving Arizona Regional Extension Center (REC) Services (n = 215)

Characteristics					
Respondent role in practice	Clinician	41 (19)			
	Practice or office manager	123 (57)			
	Others	51 (24)			
Stage of Service Receiving from REC	Engagement (Electronic Health Record system (EHR) not yet se- lected)	12 (6)			
	Selection (actively selecting an EHR)	5 (2)			
	Planning (EHR selected but not implemented)	5 (2)			
	Implementation (in process of implementing EHR)	11 (5)			
	Meaningful Use (in process of adjusting EHR to meet Stage 1 Meaningful Use requirements)	78 (36)			
	Attestation successfully completed	100 (47)			
Practice location	Rural county	62 (29)			
	Urban county	153 (71)			
Practice Size	Small (n <sub>provider</sub> = 1)	77 (36)			
	Medium (n <sub>provider</sub> = 2-4)	82 (38)			
	Large ( $n_{provider} \ge 5$ )	56 (26)			
Vendor	eClinicalWorks	41 (19)			
	Amazing Charts EHR	14 (7)			
	NextGen HER	13 (6)			
	e-MDs Solution Series EMR	12 (6)			
	Others	104 (48)			
Type of Electronic Health	Web-based	58 (27)			
Record System Used	Client/server-based	134 (62)			
	Had not vet decided	17 (8)			

<sup>a</sup>characteristic-specific percentages may not sum to 100 percent due to missing data or item non-response

Table 2Distribution of Responses Regarding Arizona Regional Extension Center (REC) Service Satisfaction Stratified by Subgroups<sup>a</sup> (Section II, Part 1.) (n = 215)

Item	Re- sponse	Achieved ful Use	Meaning-	p-value	Respondent identity		p-value
	Options	Yes (n = 100)	No (n = 115)		Clinician (n = 41)	Non-clinician (n = 174)	
Q1. The education	SA	53 (53)	37 (32)	0.015 <sup>b</sup>	23 (56)	67 (39)	0.269
provided by the REC	А	34 (34)	53 (46)		10 (24)	77 (44)	
plicable to our prac-	D	4 (4)	5 (4)		5 (12)	4 (2)	
tice's daily work	SD	1 (1)	1 (1)			2 (1)	
Q2. Training provided	SA	41 (41)	34 (30)	0.221	18 (44)	57 (33)	0.305
by the REC team was	А	39 (39)	52 (45)		12 (29)	79 (45)	
our practice's daily	D	6 (6)	6 (5)		4 (10)	8 (5)	
work	SD	1 (1)	1 (1)			2 (1)	
Q3. The REC team	SA	60 (60)	53 (46)	0.097	26 (63)	87 (50)	0.262
provided <u>quick re-</u>	А	37 (37)	48 (42)		12 (29)	73 (42)	
tice inquiries	D	1 (1)	4 (3)		2 (5)	3 (2)	
	SD						
Q4. The REC team	SA	74 (74)	65 (57)	0.053	29 (71)	110 (63)	0.309
acted in a <u>profes-</u> <u>sional manner</u>	А	26 (26)	41 (36)		10 (24)	57 (33)	
	D						
	SD						
Q5. The workflow redesign created by the REC team has <u>im-</u> <u>proved</u> our office <u>effi</u> -	SA	16 (16)	13 (11)	0.311	6 (15)	23 (13)	0.828
	А	42 (42)	48 (42)		17 (41)	73 (42)	
	D	7 (7)	11 (10)		3 (7)	15 (9)	
<u>ciency</u>	SD	2 (2)	2 (2)		1 (2)	3 (2)	
Q6. The workflow	SA	15 (15)	13 (11)	0.382	6 (15)	22 (13)	0.793
Q6. The workflow redesign created by	А	41 (41)	42 (37)		16 (39)	67 (39)	
hanced our office ef-	D	8 (8)	11 (10)		3 (7)	16 (9)	
fectiveness	SD	1 (1)	2 (2)		1 (2)	2 (1)	
Q7. The REC program	SA	16 (16)	16 (14)	0.691	10 (24)	22 (13)	0.280
has been <u>important</u> in choosing our FHR	А	19 (19)	23 (20)		6 (15)	36 (21)	
	D	21 (21)	19 (17)		7 (17)	33 (19)	
	SD	8 (8)	7 (6)		3 (7)	12 (7)	
Q8. The REC program	SA	60 (60)	45 (39)	0.032 <sup>b</sup>	26 (63)	79 (45)	0.040 <sup>b</sup>
has <u>helped</u> our prac- tice progress toward	А	35 (35)	42 (37)		10 (24)	67 (39)	
meaningful use	D	1 (1)	4 (3)			5 (3)	
	SD	1 (1)	3 (3)		1 (2)	3 (2)	
Q9. The REC team	SA	68 (68)	51 (44)	0.010 <sup>b</sup>	29 (71)	90 (52)	0.048 <sup>b</sup>
was <u>knowledgeable</u> about the CMS incen-	А	30 (30)	46 (40)		9 (22)	67 (39)	
tive program eligibil-	D		1 (1)			1 (1)	
ity criteria	SD	1 (1)	2 (2)		1 (2)	2 (1)	

ltem	Re- sponse	Achieved ful Use	Meaning-	p-value	Responde	ent identity	p-value
	Options	Yes (n = 100)	No (n = 115)		Clinician (n = 41)	Non-clinician (n = 174)	
Q10. The REC team	SA	66 (66)	51 (44)	0.026 <sup>b</sup>	28 (68)	89 (51)	0.117
was <u>knowledgeable</u> about how the "Meaningful Use"	А	32 (32)	45 (39)		9 (22)	68 (39)	
	D	1 (1)	2 (2)		1 (2)	2 (1)	
criteria apply to our practice	SD		1 (1)		1 (2)		
Q11. My practice	SA	63 (63)	62 (54)	0.445	28 (68)	97 (56)	0.137
would <u>recommend</u>	А	34 (34)	39 (34)		11 (27)	62 (36)	
another practice	D		2 (2)			2 (1)	
	SD	1 (1)	1 (1)			2 (1)	

### Table 2 Continued

\*SA = strongly agree, A = agree, D = disagree, SD = strongly disagree; EHR = electronic health record system \*statistical differences between subgroups were tested using Wilcoxon rank-sum test for dichotomous subgroups and non-parametric trend test for ordinal subgroups

\*No statistically significant differences were found in subgroups of practice size (small/medium/large), location (urban/rural), EHR system (web-based EHR vs. others, including non-users), and vendor (eClinicalWork vs. others) adata presented as frequency (percentage); item-specific percentages may not sum to 100 percent due to missing data or item non-response

<sup>b</sup>denotes statistically significant differences (p<0.05)

Table 3 Distribution	n of Responses R	egarding Arizona	Regional Extensio	n Center (REC)	Service Satisfa	ction Stratified by	Subgroups <sup>a</sup> (S	ection II, Part 2.	.) (n = 215)		
ltem	Response	Achieved Mo	eaningful Use	p-value	Web-Based	EHR	p-value	<b>Practice Siz</b>	ie ie		p-value
	Options	Yes (n = 100)	No (n = 115)		Yes (n = 58)	No (n = 157)		Small (n = 77)	Medium (n = 82)	Large (n = 56)	
Q1. The REC's online	ES	12 (12)	11 (10)	0.638	4 (7)	19 (12)	0.565	12 (16)	9 (11)	2 (4)	0.077
educational mod-	S	43 (43)	40 (35)		25 (43)	58 (37)		27 (35)	34 (41)	22 (39)	
nico	DS	;	3 (3)		:	3 (2)		2 (3)	1 (1)	:	
	EDS	1 (1)	1		:	1 (1)		:	;	1 (2)	
Q2. The REC's live	ES	14 (14)	12 (10)	0.262	6 (10)	20 (13)	0.692	13 (17)	8 (10)	5 (9)	0.176
events	S	37 (37)	29 (25)		20 (35)	46 (29)		24 (31)	29 (35)	13 (23)	
	DS	:	7 (6)		:	7 (5)		2 (3)	3 (4)	2 (4)	
	EDS	1 (1)	1		:	1 (1)		:	;	1 (2)	
Q3. The REC's re-	ES	45 (45)	46 (40)	0.944	32 (55)	59 (38)	0.007 <sup>b</sup>	35 (45)	34 (41)	22 (39)	0.683
sponsiveness to in-	S	39 (39)	37 (32)		12 (21)	64 (41)		24 (31)	32 (39)	20 (36)	
quiry	DS	1 (1)	3 (3)		1 (2)	3 (2)		3 (4)	ł	1 (2)	
	EDS	;	1		1	1		:	1	1	
Q4. Usability of the	ES	11 (11)	14 (12)	0.943	6 (10)	19 (12)	0.637	12 (16)	10 (12)	3 (5)	0.065
REC's member-only	S	45 (45)	27 (23)		22 (38)	50 (32)		28 (36)	27 (33)	17 (30)	
MEDUIC	DS	1 (1)	7 (6)		1	8 (5)		2 (3)	2 (2)	4 (7)	
	EDS	:	1		1	:		:	1	;	
Q5. Education	ES	21 (21)	19 (17)	0.963	8 (14)	32 (20)	0.558	14 (18)	18 (22)	8 (14)	0.350
about the REC pro- dram prior to on-	S	47 (47)	50 (43)		28 (48)	69 (44)		32 (42)	38 (46)	27 (48)	
boarding	DS	3 (3)	1 (1)		:	4 (3)		1 (1)	1 (1)	2 (4)	
	EDS	1	1		1	1		;	:	:	

© Schattauer 2014

D. Tang et al.: Exploratory, population-based, mixed-methods program evaluation of user satisfaction of services provided by REC.

# **Research Article**

14

Table 3 Continued											
ltem	Response	Achieved M	eaningful Use	p-value	Web-Based	EHR	p-value	<b>Practice Si</b>	ze		p-value
	Options	Yes (n = 100)	No (n = 115)		Yes (n = 58)	No (n = 157)		Small (n = 77)	Medium (n = 82)	Large (n = 56)	
Q6. Communication	ES	31 (31)	22 (19)	0.268	11 (19)	42 (27)	0.256	20 (26)	21 (26)	12 (21)	0.697
about REC events	S	51 (51)	56 (49)		29 (50)	78 (50)		39 (51)	40 (49)	28 (50)	
	DS	1 (1)	1		1 (2)	:		;	1 (1)	1	
	EDS	:	1		;	1		;	;	:	
Q7. The REC's gen-	ES	40 (40)	28 (24)	0.076	25 (43)	43 (27)	0.013 <sup>b</sup>	30 (39)	24 (29)	14 (25)	0.146
eral information	S	44 (44)	52 (45)		19 (33)	77 (49)		30 (39)	39 (48)	27 (48)	
liuisivu id	DS	:	1 (1)		1	1 (1)		1 (1)	1	:	
	EDS	:	1		-	:		1	1	1	
Q8. The REC's issue	ES	38 (38)	19 (17)	0.008 <sup>b</sup>	21 (36)	36 (23)	0.019 <sup>b</sup>	28 (36)	20 (24)	9 (16)	0.019 <sup>b</sup>
resolution	S	40 (40)	47 (41)		16 (28)	71 (45)		26 (34)	37 (45)	24 (43)	
	DS	1 (1)	3 (3)		1 (2)	3 (2)		2 (3)	;	2 (4)	
	EDS	:	1		;	:		;	;	;	
Q9. My practice's	ES	48 (48)	39 (34)	0.097	31 (53)	56 (36)	0.036 <sup>b</sup>	37 (48)	29 (35)	21 (38)	0.235
overall satisfaction	S	38 (38)	48 (42)		18 (31)	68 (43)		25 (32)	38 (46)	23 (41)	
	DS	:	2 (2)		1 (2)	1 (1)		1 (1)	1 (1)	:	
	EDS	1 (1)	1 (1)		;	2 (1)		1 (1)	;	1 (2)	
*ES = extremely satis *statistical difference *No statistically signi adata presented as fri bdenotes statistically	fied, S = satisfied s between subgrc ficant differences equency (percent: significant differe	I, DS = dissatisfic oups were tested i were found in si age); item-specif ances (p<0.05)	ed, EDS = extremel l using Wilcoxon ra ubgroups of respoi ic percentages ma	y dissatisfied; ink-sum test fo ndent identity y not sum to 1	EHR=electroni or dichotomous (clinician vs. n 00 percent du	c health record sy s subgroups and i on-clinician), loca e to missing data	/stem non-parametric tion (urban vs. or item non-re	: trend test for rural), and vei sponse	ordinal subgroi ndor (eClinicalV	ups Vork vs. others)	

Applied Clinical Informatics

This document was downloaded for personal use only. Unauthorized distribution is strictly prohibited.

© Schattauer 2014

D. Tang et al.: Exploratory, population-based, mixed-methods program evaluation of user satisfaction of services provided by REC.

—					~
	Applied	Clinical	Informatics	- 10	D

ltem	Response Options	Location		p-value	Achieved Meaning- ful Use		p-value
		Urban (n = 153)	Rural (n = 62)		Yes (n = 100)	No (n = 115)	
Part 1 <sup>.c</sup>							
Q1. Security	EB	30 (20)	20 (32)	0.242	29 (29)	21 (18)	0.585
	В	63 (41)	21 (34)		44 (44)	40 (35)	
	NB	8 (5)	5 (8)		7 (7)	6 (5)	
	D						
Q2. Privacy	EB	36 (24)	19 (31)	0.709	30 (30)	25 (22)	0.750
	В	66 (43)	23 (37)		45 (45)	44 (38)	
	NB	6 (4)	5 (8)		6 (6)	5 (4)	
	D						
Q3. Preparation of EHR go-live	EB	25 (16)	13 (21)	0.490	22 (22)	16 (14)	0.157
	В	45 (29)	13 (21)		32 (32)	26 (23)	
	NB	14 (9)	6 (10)		7 (7)	13 (11)	
	D						
Q4. System en- hancements	EB	31 (20)	14 (23)	0.880	27 (27)	18 (16)	0.356
	В	53 (35)	19 (31)		39 (39)	33 (29)	
	NB	9 (6)	6 (10)		7 (7)	8 (7)	
	D						
Q5. Support for par-	EB	32 (21)	19 (31)	0.643	32 (32)	19 (17)	0.070
ticipation in other	В	60 (39)	25 (40)		43 (43)	42 (37)	
programs	NB	5 (3)	4 (6)		3 (3)	6 (5)	
	D						
Q6. Advocacy and	EB	38 (25)	28 (45)	0.032 <sup>b</sup>	39 (39)	27 (23)	0.235
support for problem	В	56 (37)	19 (31)		39 (39)	36 (31)	
resolution	NB	6 (4)	2 (3)		3 (3)	5 (4)	
	D						

Table 4Distribution of Responses Regarding Perceived Value of Secure Information Exchange and Arizona Regional Extension Center (REC) Services Stratified by Subgroups  $(n = 215)^a$ 

Item	Response Options	Location		p-value	Achieved M ful Use	leaning-	p-value
		Urban (n = 153)	Rural (n = 62)		Yes (n = 100)	No (n = 115)	
Part 2. <sup>d,e</sup>							
Q1. How often are	А	54 (35)	31 (50)	0.364	48 (48)	37 (32)	0.605
your Direct Techni- cal Assistance Pro- viders able to pro- vide the support services you request	Μ	22 (14)	15 (24)		19 (19)	18 (16)	
	0	10 (7)	1 (2)		6 (6)	5 (4)	
	Ν	6 (4)	2 (3)		4 (4)	4 (3)	
Q2. How helpful	EH	65 (42)	37 (60)	0.244	62 (62)	40 (35)	0.002 <sup>b</sup>
does your Direct	SH	22 (14)	8 (13)		11 (11)	19 (17)	
Provider contribute	NE	9 (6)	3 (5)		3 (3)	9 (8)	
to your ability to meeting Meaningful Use criteria	D						

#### Table 4 Continued

\*statistical differences between subgroups were tested using Wilcoxon rank-sum test for dichotomous subgroups and non-parametric trend test for ordinal subgroups

\*No statistically significant differences were found in subgroups of practice size (small/medium/large), respondent identity (clinician vs. non-clinician), EHR system (web-based EHR vs. others, including non-users), and vendor (eClinicalWork vs. others)

<sup>a</sup>data presented as **frequency (percentage)**; characteristic-specific percentages may not sum to 100 percent due to missing data or item non-response

<sup>b</sup>denotes statistically significant differences (p<0.05)

<sup>c</sup>EB = extremely beneficial, B = beneficial, NB = not beneficial, D = detrimental

 ${}^{d}A$  = always, M = most of the time, O = occasionally, N = never

<sup>e</sup>EH = extremely helpful, SH = somewhat helpful, NE = no effect, D = detrimental

<sup>f</sup>EHR = electronic health record system

	Applied Clinical Informatics	18
	Applied Clinical Informatics	10

Characteristic		Rasch Level of Agreement (Logits)	Rasch Level of Satisfaction (Logits)	Rasch Extent of Per- ceived Benefit (Logits)
Stage 1 Meaningful Use Achieved (Yes	Yes (n = 100)	4.10 (3.51) <sup>b</sup>	4.86 (5.34)	2.20 (3.93)
vs. No)	No (n = 115)	2.82 (3.87) <sup>b</sup>	3.66 (5.92)	1.67 (4.18)
Practice Size	Small (n = 77)	3.73 (3.94)	4.91 (5.58)	1.91 (4.46)
	Medium (n = 82)	3.61 (3.52)	4.27 (5.63)	1.90 (3.73)
	Large (n = 56)	2.77 (3.80)	3.30 (5.79)	2.13 (3.93)
Rural Practice	Yes (n = 62)	3.69 (3.10)	4.18 (5.36)	2.49 (4.16)
	No (n = 153)	3.33 (3.99)	4.30 (5.80)	1.72 (3.99)
Respondent Iden- tity	Clinician $(n = 41)$	4.04 (4.34)	5.44 (5.25)	2.19 (3.84)
	Non-Clinician (n = 174)	3.29 (3.59)	4.00 (5.73)	1.90 (4.11)
Using Web-Based Electronic Health	Yes (n = 58)	3.69 (3.15)	5.66 (4.74) <sup>b</sup>	2.48 (3.63)
Record Systems (EHR)	No (n = 157)	3.33 (3.96)	3.71 (5.90) <sup>b</sup>	1.74 (4.20)
Using eClinical- Work as primary	Yes (n = 41)	3.94 (3.83)	4.26 (6.01)	2.18 (3.98)
EHR vendor	No (n = 174)	3.31 (3.73)	4.26 (5.59)	1.90 (4.08)

 Table 5
 Comparison of Rasch Composite Scores Across Subgroups (n = 215)<sup>a</sup>

<sup>a</sup>data presented as mean (standard deviation)

<sup>b</sup>denotes statistical significance

215)					
Predictors	Outcomes				
	REC has helped our practice progress toward meaningful use (strongly agree = 1 vs. other re- sponses = 0) <sup>b</sup>	Overall Satisfaction (extremely satisfied=1 vs. other responses = 0) <sup>c</sup>	Rasch Level of Agreement (Logits)	Rasch Level of Sat- isfaction (Logits)	Rasch Extent of Perc ed Benefit (Logits)
	Odds Ratio (95% Confidence Interval)		<b>Regression Cofficient</b>	(95% Confidence Int	erval)
Stage 1 Meaningful Use Achieved (Yes vs. No)	1.82 (1.01–3.29)*	1.60 (0.86–2.97)	1.23 (0.21–2.26)*	1.18 (-0.49–2.84)	0.51 (-0.77–1.80)
Number of Participating Providers	1.00 (0.97–1.04)	0.95 (0.89–1.03)	-0.03 (-0.10–0.04)	-0.10 (-0.22–0.03)	0.01 (-0.07–0.09)
Rural Practice (vs. Urban)	0.91 (0.45–1.75)	1.09 (0.55–2.13)	0.35 (-0.79–1.48)	-0.21 (-2.03-1.62)	0.61 (-0.79–2.01)
Respondent Identity (Clinician vs. Non-Clini- cian)	2.33 (1.06–5.16)*	1.78 (0.78–4.06)	0.70 (-0.60–2.00)	1.23 (-0.96–3.42)	0.28 (-1.33–1.90)
Using Web-Based Elec- tronic Health Record Sys- tems (EHR) (vs. others <sup>a</sup> )	1.03 (0.53–3.29)	2.06 (1.02–4.18)*	0.45 (-0.72–1.62)	1.92 (0.03–3.81)*	0.87 (-0.60–2.34)
Using eClinicalWork as primary EHR vendor (vs. other vendors)	0.83 (0.40–1.76)	1.03 (0.47–2.25)	0.52 (-0.81–1.85)	0.15 (-1.98–2.27)	0.47 (-1.17–2.10)
<sup>a</sup> including those using clie <sup>b</sup> other responses included <sup>c</sup> other responses included *denotes statistical signifi	nt/server based systems (n = 134), have not yet c "agree," "disagree," and "strongly disagree" "satisfied," "dissatisfied," and "extremely dissat cance (p<0.05)	ecided (n = 17), or unknown prim sfied "	ary EHR status ( $n = 6$ )		

eiv-

© Schattauer 2014

D. Tang et al.: Exploratory, population-based, mixed-methods program evaluation of user satisfaction of services provided by REC.

Applied Clinical Informatics 19

Table 7Sensitivity Analysis: Distribution of Responses Regarding Arizona Regional Extension Center (REC) ServiceSatisfaction Between Respondents Currently and Previously Receiving REC Services<sup>a</sup> (Section II, Part 1.)

ltem	Response Options	Currently (n = 215)	Previously (n = 44)	p-value
Q1. The <b>education</b> provided by the REC team was di-	SA	90 (42)	8 (18)	0.003 <sup>b</sup>
rectly applicable to our practice's daily work	А	87 (40)	19 (43)	
	D	9 (4)	4 (9)	
	SD	2 (1)	2 (5)	
Q2. Training provided by the REC team was directly	SA	75 (35)	9 (20)	0.015 <sup>b</sup>
applicable to our practice's daily work	А	91 (42)	17 (39)	
	D	12 (6)	5 (11)	
	SD	2 (1)	3 (7)	
Q3. The REC team provided <b>quick responses</b> to our	SA	113 (53)	16 (36)	0.043 <sup>b</sup>
practice inquiries	А	85 (40)	15 (34)	
	D	5 (2)	3 (7)	
	SD		3 (7)	
Q4. The REC team acted in a professional manner	SA	139 (65)	19 (43)	0.154
	А	67 (31)	14 (32)	
	D			
	SD		1 (2)	
Q5. The workflow redesign created by the REC team has <b>improved</b> our office <b>efficiency</b>	SA	29 (13)	3 (7)	0.050
	А	90 (42)	14 (32)	
	D	18 (8)	5 (11)	
	SD	4 (2)	3 (7)	
Q6. The workflow redesign created by the REC team	SA	28 (13)	5 (11)	0.331
has enhanced our office effectiveness	А	83 (39)	11 (25)	
	D	19 (9)	5 (11)	
	SD	3 (1)	2 (5)	
Q7. The REC program has been <b>important</b> in choosing	SA	32 (15)	4 (9)	0.017 <sup>b</sup>
our EHR	А	42 (20)	5 (11)	
	D	40 (19)	7 (16)	
	SD	15 (7)	9 (20)	
Q8. The REC program has <b>helped</b> our practice <b>prog</b> -	SA	105 (49)	12 (27)	0.011 <sup>b</sup>
ress toward meaningful use	А	77 (36)	16 (36)	
	D	5 (2)	4 (9)	
	SD	4 (2)	2 (5)	
Q9. The REC team was <b>knowledgeable</b> about the	SA	119 (55)	16 (36)	0.096
CMS incentive program eligibility criteria	А	76 (35)	17 (39)	
	D	1 (0)	1 (2)	
	SD	3 (1)	1 (2)	

#### Table 7 Continued

Item	Response Options	Currently (n = 215)	Previously (n = 44)	p-value
Q10. The REC team was <b>knowledgeable</b> about how the "Meaningful Use" criteria apply to our practice	SA	117 (54)	16 (36)	0.117
	А	77 (36)	15 (34)	
	D	3 (1)	2 (5)	
	SD	1 (0)	1 (2)	
Q11. My practice would <b>recommend</b> the REC services to another practice	SA	125 (58)	20 (45)	0.329
	А	73 (34)	13 (30)	
	D	2 (1)		
	SD	2 (1)	3 (7)	

\*SA = strongly agree, A = agree, D = disagree, SD = strongly disagree; EHR = electronic health record system \*statistical differences were tested using Wilcoxon rank-sum test

<sup>a</sup>data presented as **frequency (percentage)**; item-specific percentages may not sum to 100 percent due to missing data or item non-response

<sup>b</sup>denotes statistically significant differences (p<0.05)

Table 8	Sensitivity Analysis: Distribution of Responses Regarding Arizona Regional Extension Center (REC) Service
Satisfactio	Between Respondents Currently and Previously Receiving REC Services <sup>a</sup> (Section II, Part 2.)

ltem	Response Options	Currently (n = 215)	Previously (n = 44)	p-value	
Q1. The REC's online educational modules	ES	23 (11)	3 (7)	0.387	
	S	83 (39)	12 (27)		
	DS	3 (1)			
	EDS	1 (0)	2 (5)		
Q2. The REC's live events	ES	26 (12)	4 (9)	0.356	
	S	66 (31)	13 (30)		
	DS	7 (3)	2 (5)		
	EDS	1 (0)	1 (2)		
Q3. The REC's responsiveness to inquiry	ES	91 (42)	13 (30)	0.110	
	S	76 (35)	16 (36)		
	DS	4 (2)	2 (5)		
	EDS		1 (2)		
Q4. Usability of the REC's member-only web-	ES	25 (12)	1 (2)	0.042 <sup>b</sup>	
site	S	72 (33)	14 (32)		
	DS	8 (4)	2 (5)		
	EDS		1 (2)		
Q5. Education about the REC program prior to	ES	40 (19)	2 (5)	0.006 <sup>b</sup>	
onboarding	S	97 (45)	22 (50)		
	DS	4 (2)	1 (2)		
	EDS		2 (5)		

nued

Item	Response Options	Currently (n = 215)	Previously (n = 44)	p-value	
Q6. Communication about REC events	ES	53 (25)	2 (5)	<0.001 <sup>b</sup>	
	S	107 (50)	25 (57)		
	DS	1 (0)	1 (2)		
	EDS		2 (5)		
Q7. The REC's general information provision	ES	68 (32)	7 (16)	0.006 <sup>b</sup>	
	S	96 (45)	24 (55)		
	DS	1 (0)	1 (2)		
	EDS		2 (5)		
Q8. The REC's issue resolution	ES	57 (27)	6 (14)	0.041 <sup>b</sup>	
	S	87 (40)	18 (41)		
	DS	4 (2)	1 (2)		
	EDS		2 (5)		
Q9. My practice's overall satisfaction with the	ES	86 (40)	9 (20)	<b>0.007</b> <sup>b</sup>	
Arizona REC	S	87 (40)	22 (50)		
	DS	2 (1)	1 (2)		
	EDS	2 (1)	2 (5)		

\*ES = extremely satisfied, S = satisfied, DS = dissatisfied, EDS = extremely dissatisfied; EHR = electronic health record system

\*statistical differences were tested using Wilcoxon rank-sum test

<sup>a</sup>data presented as frequency (percentage); item-specific percentages may not sum to 100 percent due to missing data or item non-response

<sup>b</sup>denotes statistically significant differences (p<0.05)

Table 9	Sensitivity Analysis: Distribution of Responses Regarding Perceived Value of Secure Information Exchange
and Arizon	a Regional Extension Center (REC) Services Between Respondents Currently and Previously Receiving REC
Services <sup>a</sup>	

Item	Response Options	Currently (n = 215)	Previously (n = 44)	p-value
Part 1.c				
Q1. Security	EB	50 (23)	6 (14)	0.480
	В	84 (39)	16 (36)	
	NB	13 (6)	2 (5)	
	D			
Q2. Privacy	EB	55 (26)	6 (14)	0.387
	В	89 (41)	15 (34)	
	NB	11 (5)	2 (5)	
	D			

Table 9Continued

Item	Response Options	Currently (n = 215)	Previously (n = 44)	p-value
Q3. Preparation of EHR go-live	EB	38 (18)	3 (7)	0.071
	В	58 (27)	10 (23)	
	NB	20 (9)	6 (14)	
	D			
Q4. System enhancements	EB	45 (21)	5 (11)	0.269
	В	72 (33)	11 (25)	
	NB	15 (7)	4 (9)	
	D			
Q5. Support for participation in other quality assurance programs	EB	51 (24)	4 (9)	0.040 <sup>b</sup>
	В	85 (40)	14 (32)	
	NB	9 (4)	4 (9)	
	D			
Q6. Advocacy and support for problem resolution	EB	66 (31)	7 (16)	0.375
	В	75 (35)	16 (36)	
	NB	8 (4)		
	D			
Part 2. <sup>d,e</sup>				
Q1. How often are your Direct Technical Assistance	А	85 (40)	11 (25)	0.043 <sup>b</sup>
Providers able to provide the support services you re-	Μ	37 (17)	9 (20)	
quest	0	11 (5)	4 (9)	
	Ν	8 (4)	3 (7)	
Q2. How helpful does your Direct Technical Assistance	EH	102 (47)	11 (25)	0.016 <sup>b</sup>
Provider contribute to your ability to meeting Mean-	SH	30 (14)	9 (20)	
ingful Use criteria	NE	12 (6)	4 (9)	
	D			

\*statistical differences were tested using Wilcoxon rank-sum test

<sup>a</sup>data presented as frequency (percentage); characteristic-specific percentages may not sum to 100 percent due to missing data or item non-response

<sup>b</sup>denotes statistically significant differences (p<0.05)

<sup>c</sup>EB = extremely beneficial, B = beneficial, NB = not beneficial, D = detrimental

 ${}^{d}A = always$ , M = most of the time, O = occasionally, N = never

 $^{e}EH = extremely helpful, SH = somewhat helpful, NE = no effect, D = detrimental$ 

<sup>f</sup>EHR = electronic health record system

# References

- 1. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. Ann Intern Med 2006; 144: 742-752.
- 2. Parente ST, McCullough JS. Health information technology and patient safety: evidence from panel data. Health Aff 2009; 28: 357–360.
- 3. McCullough JS, Casey M, Moscovice I, Prasad S. The effect of health information technology on quality in U.S. hospitals. Health Aff 2010; 29: 647–654.
- 4. Davis K, Doty M, Shea K, Stremikis K. Health information technology and physician perceptions of quality of care and satisfaction. Health Policy 2009; 90: 239–246.
- Goldzweig CL, Towfigh A, Maglione M, Shekelle PG. Costs and benefits of health information technology: new trends from the literature. Health Aff 2009; 28: w282-w293.
- 6. Jha AK. Meaningful use of electronic health records: The road ahead. JAMA 2010; 304: 1709–1710.
- Centers for Medicare & Medicaid Services. EHR Incentive Programs. Available at: http://www.cms.gov/ Regulations-and- Guidance /Legislation/ EHRIncentivePrograms/Eligible\_Hospital\_Information.html. Accessed October 13, 2013.
- 8. Blumenthal D, Tavenner M. The meaningful use regulation for electronic health records. N Engl J Med 2010; 363: 501–504.
- 9. Hogan SO, Kissam SM. Measuring meaningful use. Health Aff 2010; 29: 601-606.
- 10. Buntin MB, Jain SH, Blumenthal D. Health information technology: laying the infrastructure for national health reform. Health Aff 2010; 29: 1214–1219.
- 11.Price JH, Dake JA, Murman J, Dimmig J, Akpanudo S. Power analysis in survey research: importance and use for health educators. Am J Health Educ 2005; 36: 202–207.
- 12. Coughlin SS. Recall bias in epidemiologic studies. J Clin Epidemiol 1990; 43: 87-91.
- Gordon RJ. Arizona Rural Health Provider Atlas. Rural Health Office, Department of Family and Community Medicine, University of Arizona College of Medicine. pp. 1–152, 1987.
- 14. Kennedy P. A Guide to Econometrics. Oxford: Blackwell. 1992.
- 15. Vittinghoff E, Glidden DV, Shiboski SC, McCulloch CE. Regression methods in biostatistics. New York: Springer, 2005.
- 16.Dooley LM, Lindner JR. The handling of nonresponse error. Human Resource Development Quarterly 2003; 14: 99–110.
- 17. Linacre J. Understanding Rasch measurement: Optimizing rating scale category effectiveness. J Appl Meas 2002; 3: 85–106.
- 18. Richards L. Handling qualitative data. California: Sage, 2005.
- 19. Maxson E, Jain S, Kendall M, Mostashari F, Blumenthal D. The Regional Extension Center Program: helping physicians meaningfully use health information technology. Ann Intern Med 2010; 153: 666–670.
- 20. Jamoom E, Beatty P, Bercovitz A, et al. Physician adoption of electronic health record systems: United States, 2011. NCHS data brief, no 98. Hyattsville, MD: National Center for Health Statistics, 2012.
- 21.McDonnell C, Werner K, Wendel L. Electronic Health Record Usability: Vendor Practices and Perspectives. AHRQ Publication No. 09(10)-0091–3-EF. Rockville, MD: Agency for Healthcare Research and Quality, 2010.
- 22. Johnson WG, Harootunian G, Sama T. The use of electronic medical records and physicians' attitudes towards a health information exchange. Phoenix, AZ: Arizona State University, Center for Health Information & Research, 2012.
- 23. Aharony L, Strasser S. Patient satisfaction: what we know about and what we still need to explore. Medical Care Review 1993; 50(1): 49–79.
- 24. Ko HH, Zhang H, Telford JJ, Enns R. Factors influencing patient satisfaction when undergoing endoscopic procedures. Gastrointest Endosc 2009; 69: 883-891.
- 25. Johnson RB, Onwuegbuzie AJ. Mixed methods research: A research paradigm whose time has come. Educ Res 2004; 33: 14–26.