

A Pilot with Interactive eHealth tool for Pre-Consult Assessment of Common Mental Disorders in a Community Health Center

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A Pilot with Interactive eHealth tool for Pre-Consult Assessment of Common Mental Disorders in a Community Health Center (CHC)

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ABSTRACT

Background: Access disparities for mental health (MH) care exist for vulnerable ethno-cultural and immigrant groups. CHCs serving these groups could be supported further by emerging eHealth tools.

Methods: An Interactive Computer-assisted Client Assessment Survey (iCCAS) tool was developed for pre-consult assessment of common mental disorders (using PHQ9, GAD7, PTSD-PC and CAGE), with point-of-care reports. The pilot RCT recruited (response rate 78.6%) adult patients, fluent in English or Spanish, and seeing a physician or nurse practitioner at the partnering CHC in Toronto. Randomization into iCCAS or Usual Care (UC) was computer generated and allocation concealed in sequentially numbered, opaque envelopes that were opened after consent. The objectives were to examine the interventions' efficacy in improving MH discussion (primary) and symptom detection (secondary). Data were collected by a paper-pencil Exit Survey and chart review.

Results: iCCAS (n=75) and UC (n=72) groups were similar in socio-demographics. Almost 61% identified as females and 98% were immigrants. MH discussion occurred for 58.7% in iCCAS and 40.3% in UC group ($p \leq 0.05$). In GLMM, the intervention effect on discussion remained significant (Adj OR 2.1; 95% CI: 1.1-4.2) while controlling for language and gender. MH detection occurred for 38.7% in iCCAS and 27.8% in UC group ($p > 0.05$). In GLMM, the intervention effect on detection was not significant (Adj OR 1.9; 95% CI: 0.4-10.8) beyond the effect of language, education and employment.

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Interpretation: The studied intervention holds potential for CHCs to improve discussion and detection of CMDs. Future multi-site research would enhance generalizability.

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INTRODUCTION

The World Health Organization predicts that common mental disorders such as depression will rank first in the burden of diseases for high income countries by 2030.¹ Depression can usually be effectively managed in primary care, however the majority of people with this illness in Canada do not get treatment.² The rate of depression in those visiting family practices is high (range 14% to 45%)³⁻⁶, because of this maximizing its identification in primary care has been considered as a possible way of increasing the number of people being appropriately treated.^{7,8}

Ethno-cultural and immigrant groups from non-European and low-income backgrounds in Canada are less likely to have their common mental disorders (such as depression, anxiety and post-traumatic stress disorder) treated than their peers^{9,10} as they often encounter multifold barriers to access timely care.^{10, 11-13} The development of Community Health Centers (CHCs) has been effective in decreasing barriers to care for physical health for vulnerable communities such as immigrant and ethno-cultural groups in Ontario.¹⁴ Studies report that CHC patients visit emergency departments less frequently and receive higher preventative care and chronic disease management compared to patients enrolled in other primary care models.¹⁵⁻¹⁸ Despite these successes CHC resources are stretched due to the complex and growing needs of the vulnerable communities whom they aim to serve. In such situations mental health problems may be less likely to be identified than physical health issues.

Increasing the ascertainment of common mental disorders (CMDs) in CHCs could be one way of decreasing disparities in mental health treatment for vulnerable ethno-cultural and immigrant groups. A recent innovation in this regard is the development of interactive and user-friendly

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3 pre-consult eHealth tools. These tools can be available in the waiting room and can be used to
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5 alleviate some patient barriers (e.g., knowledge gaps, stigma and communication difficulties)
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7 and provider constraints such as time.^{19,20}
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12 The authors developed an Interactive Computer-Assisted Client Assessment Survey (iCCAS)
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14 tool in English and Spanish for CMDs.²¹⁻²³ This study reports a randomized controlled trial of the
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16 efficacy of the tool for improving discussion about mental health issues and detection of mental
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18 illness in an urban CHC in Toronto, Canada.
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21 22 23 24 **METHODS**

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27 The study protocol was developed in collaboration with the partnering CHC and research ethics
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29 approval was obtained from xx University. We followed CONSORT guidelines for non-
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31 pharmacological interventions.²⁴
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34 35 36 *Study Site*

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38 The partnering CHC, Access Alliance is located in Toronto where over 50% of the residents are
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40 immigrants and a majority identify themselves as members of racialized communities.²⁵ The
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42 three clinics of the CHC serve primarily immigrant, refugee and racialized ethno-racial
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44 communities who report English and Spanish as their top preferred languages. The CHC
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46 employed four family physicians and five nurse practitioners along with a multidisciplinary team
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48 at the time of study.
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51 52 53 54 55 *Intervention*

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3 The study intervention was a touch-screen iCCAS with validated CMD screening scales
4 administered to patients in the waiting room that produced individualized reports for patients and
5 clinicians prior to seeing the family physician or nurse practitioner. Completion time ranged
6 from 10 to 15 minutes. Data were encrypted and collected on a secure remote server. The
7 research assistant (RA) printed the reports using a password protected web portal. The Patient
8 Recommendation Sheet summarized the risks, provided information about community resources
9 and made suggestions to seek the clinician's advice when a risk was reported. The Clinician Risk
10 Report was a 1-page summary of the health risks and included scores and symptoms of the
11 assessed CMDs along with possible referral pathways.
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27 The development of the intervention included several steps.

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31 First, a comprehensive literature review of tools for identifying CMDs was undertaken. Twenty
32 questionnaires used to identify CMDs of depression, generalized anxiety, post-traumatic stress
33 disorder and alcohol abuse in community or primary care samples were assessed on length,
34 reliability, validity and use in diverse groups. The final selection of tools aimed for brevity while
35 maintaining coverage of different CMDs important to diverse populations and cross cultural
36 validity. The final 52-item survey included the Patient Health Questionnaire 9 (PHQ9)²⁶;
37 Generalized Anxiety Disorder 7 (GAD7)²⁷; Post Traumatic Stress Disorder-Primary Care
38 (PTSD-PC)²⁸; and CAGE²⁹ scales; and items pertaining to the social determinants of health (e.g.,
39 education, English language ability, housing, financial means to meet daily needs, immigration
40 status and social support).
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3 Final survey and report structure was determined with input from researchers and CHC partners;
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5 the survey was translated to, and back-translated from Spanish and a usability pilot was
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7 conducted with 9 clinicians and patients.
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10 11 *Participants and Procedures*

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13 All family physicians (FPs) and nurse practitioners (NPs) at the CHC were eligible to participate
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15 and provided informed written consent, permitting recruitment of their patients. Prior to patient
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17 recruitment, they received a workshop with field updates on the four included CMDs by a mental
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19 health expert (KM). Blinding of clinicians was not possible due to nature of the intervention.
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23 Patient inclusion criteria were: at least 18 years old; proficiency in English or Spanish language;
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25 and visiting a consenting clinician. Exclusion criteria were: patients accompanied by a family
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27 member for interpretation; new patients; patients feeling unwell (self-report); or RA's inability to
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29 offer details (e.g. privacy or comprehension issues).
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38 Three trained RAs (two bilingual) approached patients in the waiting room and applied eligibility
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40 criteria. Eligible and willing patients received the study details in a separate room and provided
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42 informed written consent. The consenting patients were then randomized into the intervention
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44 (iCCAS) and control (Usual Care) group using 1:1 allocation. The randomized allocation
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46 sequence was computer generated by an off-site biostatistician prior to recruitment and
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48 concealed by using sequentially numbered, opaque envelopes (SNOSE).³⁰ The envelopes were
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50 opened after consent, keeping patients and recruiters blind to the assignment.
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3 Before seeing the clinician, patients assigned to the iCCAS group completed the interactive
4 survey using an iPad and received a printout of their tailored Recommendation Sheet. The Risk
5 Report for clinicians was attached to each patient file before the consultation. Patients assigned
6 to the control group continued to receive usual care with no health-risk assessments prior to the
7 consultation. After the visit, patients in both groups completed a paper-pencil Exit Survey and
8 received a Resource list. At this time, all patients were asked whether he/she would like to see a
9 counselor for issues covered in the study surveys.
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21 22 ***Outcomes and Data Collection*** 23

24 The main outcomes were patient discussion (yes or no) on mental health (MH) and clinician
25 detection (yes or no) of MH symptoms. The former was measured by the Exit Survey and the
26 latter by review of the medical charts (clinical notes section) for both groups. Patient socio-
27 demographic and health/care related information was collected for both groups by the Exit
28 Survey. The tool's acceptance and technological quality were assessed in the intervention group
29 by including the Computerized Lifestyle Assessment Scale (CLAS)^{31,32} for assessing perceived
30 Benefits, Privacy-Barriers and Interaction-Barriers on 5-point (disagree, not sure or agree) sub-
31 scales, and four quality questions (easy or difficult)^{33,34} in the Exit Survey. The review of
32 electronic medical charts was completed by using a data extraction form that was developed
33 with assistance of the clinic's IT team and piloted prior to its use.
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50 51 ***Statistical Analysis*** 52

53 A total recruitment of 150 patients was planned for this pilot study, with MH discussion as the
54 primary outcome of interest; the sample size of 75 patients per group was based on an anticipated
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3 improvement of a 20-25% increase in the patient discussion rate due to the intervention. The
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5 numbers of patients randomized and included in the final analyses are detailed in Figure 1.
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10 The socio-demographic characteristics of patients randomized to each of the two groups (iCCAS
11 and Control) were first compared using bivariate analyses, and subsequent analyses for health-
12 related characteristics were performed; correlations within patients seen by the same medical
13 staff (FP/NP) were accounted for in these analyses using the generalized linear mixed model
14 (GLMM) approach. The associations between the two MH outcomes (discussion and detection)
15 and patient characteristics (socio-demographic and health-related) were examined similarly. To
16 evaluate the effectiveness of the intervention (iCCAS), while taking into account patient
17 characteristics and patient correlations, multivariable analyses using GLMM were employed;
18 variables (e.g. gender and language) included in the multivariable analyses were based on
19 clinician investigators' input, literature review and statistical evidence. Statistical analyses were
20 performed using SAS Version 9.4 and SPSS Version 22.
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39 **RESULTS**

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41 Out of 199 eligible patients, 154 provided informed consent and were randomized into the
42 intervention or control group (iCCAS = 77; Usual Care = 77), yielding a response rate of 78.6%
43 (Figure 1). Patients in the iCCAS group reported 'agreement' with the perceived Benefits of the
44 tool (mean 4.1, SD 0.6) and were 'not sure' for the Barriers to privacy (mean 2.6, SD 0.8) and
45 interaction (mean 2.8, SD 0.9). Over 95% found the technology easy to use.
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55 *Socio-demographics*

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3 Overall, patient age ranged from 18 to 71 years (mean 37, SD 1.0), 61% identified as females
4 and 78% participated in the study using English language. Ninety-eight percent were immigrants
5 and the top three regions of birth were: Latin America 33.3%; South Asia, 27.9%; and Africa or
6 Middle East 16.3%. There were no statistically significant differences in the socio-demographic
7 characteristics between the iCCAS and the Usual Care groups (Table 1 and Table 2).
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18 ***Outcomes by Sociodemographics***

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20 MH discussion occurred in 49.7% (73/147) of patients. The discussion frequency was higher for
21 English-speaking (86.3%) than Spanish-speaking (13.7%) patients, ($p \leq 0.05$). Further, patients
22 who had a MH discussion received MH referral more often (30%) than patients without MH
23 discussion (5.4%), ($p \leq 0.001$). None of the other socio-demographic or health related variables
24 were significantly associated with the MH discussion. The secondary outcome of MH detection
25 occurred for 33.3% (49/147) of patients. The frequency of MH detection was higher for English-
26 speaking (89.8%) than Spanish-speaking (10.2%) patients, ($p < 0.05$). MH detection occurred
27 more often for unemployed (79.6%) than part- or full-time employed (20.4%) patients, ($p \leq$
28 0.05). Patients who had a MH detection received MH referral more often (42.9%) than patients
29 without MH detection (5.1%), ($p \leq 0.001$). Patients with MH detection were also more likely to
30 report poor or fair self-reported health (59.2%) than patients without detection (22.45), ($p \leq$
31 0.001). Other socio-demographic or health related variables were not significantly associated
32 with MH detection.
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53 ***Outcomes by Intervention***

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3 Analysis of the intervention and control groups reveals that 58.7% of patients in the iCCAS
4 group had a MH discussion compared to 40.3% in the Usual Care group ($p \leq 0.05$) (Table 4). In
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6 the final GLMM model, the effect of the iCCAS on mental health discussion remained
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8 statistically significant (Adj Odds Ratio [OR] 2.1, $p = 0.03$) while controlling for language and
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10 gender (Table 3). In terms of MH detection, 38.7% of patients in the iCCAS group had a clinical
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12 detection of mental health symptoms compared to 27.8% in the Usual Care group ($p > 0.05$). In
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14 the final GLMM model, the effect of iCCAS was not statistically significant (Adj OR 1.93, $p =$
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16 0.08) while the effect of language, education, and employment were significant on MH
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18 detection.
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27 **INTERPRETATION**

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29 Our study with a multicultural sample of patients, shows that an interactive, user-friendly, CMD
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31 health-risk assessment tool in English and Spanish administered by touch-screen tablet was
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33 effective in significantly increasing the frequency of patient discussions on mental health with
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35 their attending clinicians at the collaborating community health center. The Numbers Needed to
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37 Treat (NNT) is five for one positive-screen. The study clinicians also detected the mental health
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39 symptoms more frequently in the iCCAS intervention group than the usual care though the
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41 difference was not quite significant in multivariate analysis. The NNT is ten for one detection. At
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43 the same time, the outcomes of mental health discussion and detection were significantly
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45 correlated and patients with mental health symptom detection had a significantly higher
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47 frequency of mental health referral compared to those without detection. Patients within iCCAS
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49 group reported minimal technological difficulties, agreed with the tool's benefits and neither
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51 agree or disagree with the barriers in relation to privacy or provider interaction. Overall, the
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3 results of this pilot trial suggest that iCCAS positively facilitated the continuum of discussion,
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5 detection and referral for CMD concerns. A wider adoption of such pre-consult tools in the
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7 community clinics serving vulnerable communities could be useful in reducing patient barriers to
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9 disclose mental health concerns and clinician challenges in conducting symptom assessments⁹⁻¹⁴,
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11 facilitating diagnoses of CMDs in a timely manner. Future research with a larger sample and
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13 longitudinal arm is needed to enhance the generalizability of the reported results and to allow
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15 assessment of changes in mental health outcomes overtime.
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22 The study was also able to identify some systemic inequities in the discussion of mental health
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24 problems and identification. Compared to Spanish speaking patients (whose visits were mediated
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26 by a professional interpreter), those who spoke English had more discussion and detection of
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28 mental health symptoms. This could reflect problems related presence of interpreter or language
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30 barriers in spite of interpreter. We also found that patients with college or more education had
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32 higher rates of mental health symptom detection. Possibly this could represent differences in
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34 health literacy linked to educational attainment.^{35,36} Patients who were unemployed had a higher
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36 rate of clinician detection of mental health symptoms, than their employed counterparts. This
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38 could be related to clinicians' vigilance to low income as a risk for CMDs. Collectively, these
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40 findings point towards a complex interaction between social conditions and access to mental
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42 health care for vulnerable ethno-racialized groups.³⁷ There is an undeniable need for inter-
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44 sectoral approaches to address mental health inequities with attention to these social
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46 determinants.
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55 Our study makes a unique contribution in the area of interactive health-risk assessments for
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CMDs in primary care where only a handful of examples exist. The majority of these studies have used small convenience samples^{24, 38-40} with exceptions of eCHAT, Promote Health, and My Own Health Report (MOHR).^{22,41,42} Each of these studies, while very valuable, either does not include a control group (eCHAT), is limited to academic settings settings with an above average income population (Promote Health), or is not widely available for use (MOHR). In this emerging area of clinical informatics, the iCCAS study advances the field by recruiting immigrant, refugee and ethno-racially diverse patient population from a community health center and using rigorous randomized controlled design.

The study also has some limitations. We examined the intervention by collaborating with one community health center and this may limit generalizability. The small sample size limited our ability to examine the intervention effect by gender, ethnicity or comorbidity. The response rate of 78.6%, however, enhances confidence in the reported results. Participating providers were potentially more likely to ask about mental health because of training for the study and non-masking of the intervention. However, as these biases diminish the group difference in outcomes, our estimates of the intervention effect are likely to be underestimates. The use of chart review to measure the outcome of mental health symptom detection might have also led to an underestimation, as clinicians often take limited notes in charts. Further qualitative work (forthcoming) could assist in unpacking the underlying mechanisms through which the discussion rates improved.

In conclusion, interactive and user-friendly health-risk assessment tools in patients' language of choice hold potential to improve timely discussion and detection of common mental disorders among vulnerable immigrant communities served by the community health center model. Future

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3 research with larger samples and multiple primary care sites is needed to enhance the
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5 generalizability of the reported results.
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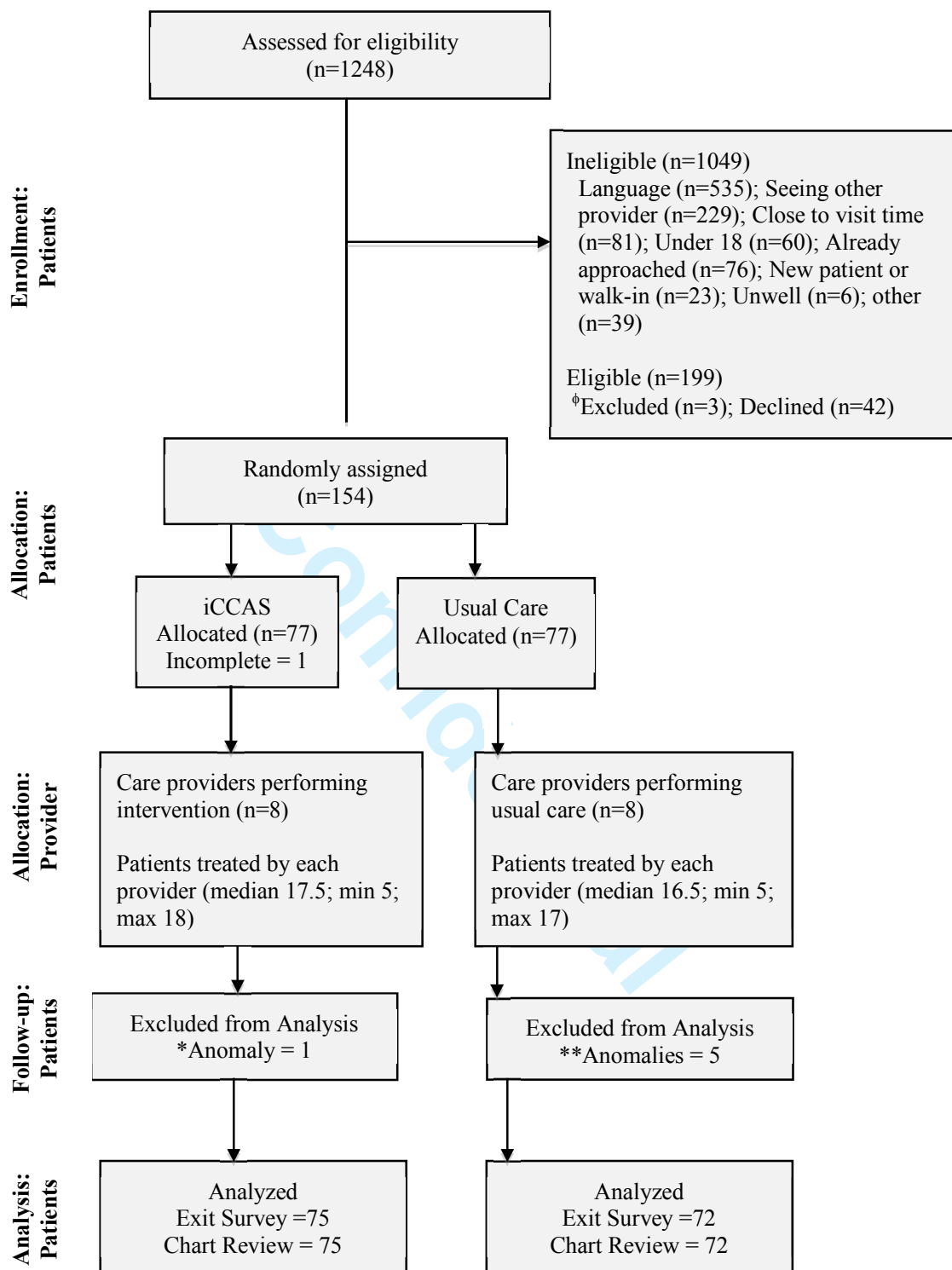
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Figure 1: Study Flow Diagram



^φ comprehension concern; * repeat participation; ** under age 1; seeing other provider 2; repeat participation 2

Table 1: Patient Socio-demographic Characteristics (n = 147)

<i>Variable</i>	<i>iCCAS (n = 75)</i>	<i>Usual Care (n = 72)</i>
Age, m (SD)	36.5 (12.7)	37.5 (12.2)
Sex, n (%)		
Male	26 (34.7)	27 (37.5)
Female	49 (65.3)	41 (56.9)
Transgender ⁺	0 (0.0)	4 (5.6)
Language, n (%)		
English	59 (78.7)	56 (77.8)
Spanish	16 (21.3)	16 (22.2)
*Relationship status, n (%)		
Married/ Common Law	37 (49.3)	38 (52.8)
Separated /Divorced/ Widowed	11 (14.7)	10 (13.9)
Single, not in relationship	18 (24.0)	16 (22.2)
Single, in relationship	10 (13.3)	9 (12.5)
Had children, n (%)	47 (62.7)	45 (62.5)
Immigrant, n (%)	74 (98.7)	70 (97.2)
Citizenship status, n (%)		
Canadian citizen/Permanent resident	54 (72.0)	50 (69.4)
Other	21 (28.0)	22 (30.6)
Years lived in Canada, n (%)		
Up to 5 years	41 (54.7)	36 (50.0)
Five or more years	34 (45.3)	36 (50.0)
Highest level of education, n (%)		
Up to grade 12	38 (50.7)	34 (47.2)
College or more	37 (49.3)	38 (52.8)
English reading/writing, n (%)		
Poor or fair	19 (25.3)	18 (25.0)
Good or more	56 (74.7)	54 (75.0)
Employment status, n (%)		
Full-time	15 (20.0)	9 (12.5)
Part-time	11 (14.7)	16 (22.2)
Not employed	49 (65.3)	47 (65.3)
Annual HH income before taxes, n (%)		
Less than 20k	48 (64.0)	46 (63.9)
20k-30k	12 (16.0)	18 (25.0)
30k-40k	8 (10.7)	2 (2.8)
40k-60k	2 (2.7)	4 (5.6)
More than 60k	5 (6.7)	2 (2.8)

* Total don't sum up as patients were allowed to select more than one response options

⁺ Subsequent analyses combined Transgender with Female (results were same on combining with Male)

No statistical differences were found between two groups

Table 2: Patient Health-related Characteristics (n = 147)

<i>Variable</i>	<i>iCCAS (n = 75)</i>	<i>Usual Care (n = 72)</i>
Self-rated health, n (%)		
Poor or fair	27 (36.0)	24 (33.3)
Good, very good or excellent	48 (64.0)	48 (66.7)
Purpose of visit, n (%)		
New problem	21 (28.0)	12 (16.7)
Routine physical exam or follow-up	54 (72.0)	60 (83.3)
Follow-up suggested in index visit, n (%)	53 (70.7)	50 (69.4)
Internal referral provided, n (%)	29 (38.6)	25 (34.7)
Mental health	13 (44.8)	10 (40.0)
Other	16 (55.2)	15 (60.0)
External referral provided, n (%)	22 (29.3)	22 (30.6)
Maternal health	2 (9.1)	1 (4.5)
Other	20 (90.9)	21 (95.5)
Visit satisfaction, n (%)		
Satisfied or very satisfied	59 (78.7)	61 (84.7)
Neutral	7 (9.3)	6 (8.3)
Dissatisfied or very dissatisfied	9 (12.0)	5 (6.9)

Table 3: Effect of Intervention (n = 147)

<i>Variable</i>	<i>No. (%) of Patients</i>		<i>Adjusted OR (95% CI)</i>
Mental health discussion	Yes	No	
Language			
English†	63 (86.3)	52 (70.3)	3.02 (1.26-7.25)**
Spanish	10 (13.7)	22 (60.8)	
Gender			
Female†	49 (67.1)	45 (60.8)	1.56 (0.76-3.20)
Male	23 (32.9)	29 (39.2)	
Group			
iCCAS†	44 (58.7)	31 (41.3)	2.13 (1.08-4.22)*
Usual care	29 (40.3)	43 (59.7)	
*p < 0.05; **p < 0.01; † reference category			
<i>Variable</i>	<i>No. (%) of Patients</i>		<i>Adjusted OR (95% CI)</i>
Mental health detection	Yes	No	
Language			
English†	44 (89.8)	71 (72.4)	3.02 (1.01-9.03)*
Spanish	5 (10.2)	27 (27.6)	
Gender			
Female†	29 (59.2)	65 (66.3)	0.79 (0.36-1.72)
Male	20 (40.8)	33 (33.7)	
Education			
College or more†	30 (61.2)	45 (45.9)	2.31 (1.08-4.96)*
Less than college	19 (38.8)	53 (54.1)	
Employed			
Full-time†	3 (6.1)	21 (21.4)	0.17 (0.04-0.66)*
Part-time‡	7 (14.3)	20 (20.4)	0.56 (0.21-1.56)
Not employed	39 (79.6)	57 (58.2)	
Group			
iCCAS†	29 (38.7)	46 (61.3)	1.93 (4.11-0.08)
Usual care	20 (27.8)	52 (72.2)	
*p < 0.05; **p < 0.01; † or ‡ reference category			