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Perceived Quality of Care of Community Health Worker and Facility Based Health Worker Management of Pneumonia in Children Under 5 Years in Western Kenya: A Cross-Sectional Multidimensional Study

ABSTRACT

Integrated community management (iCCM) programs which train lay community health workers (CHWs) in the diagnosis and treatment of diarrhea, malaria, and pneumonia have been increasingly adopted throughout sub-Saharan Africa to provide services in areas where accessibility to formal public sector health services is low. One important aspect of successful iCCM programs is the acceptability and utilization of services provided by CHWs. In order to understand community perceptions of the quality of care in an iCCM intervention in western Kenya, we employed the Primary Care Assessment Survey to compare caregiver attitudes about the diagnosis and treatment of childhood pneumonia as provided by CHWs and facility based health workers (FBHWs). Overall, caregivers rated CHWs more highly than FBHWs across a set of 10 domains that capture multiple dimensions of the care process. Caregivers perceived CHWs to provide higher quality care in terms of accessibility and patient relationship and equal quality care on clinical aspects. These results argue for the continued implementation and scale-up of iCCM programs as an acceptable intervention for increasing access to treatment for childhood pneumonia.

INTRODUCTION

Global under-five mortality has greatly declined over the last 2 decades. In order to accelerate progress in reducing under five child mortality, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have recommended the adoption of integrated community case management (iCCM) programs targeting the three major infectious killers of children under-five—diarrhea, malaria and pneumonia— to decrease mortality by 70%, 60% and 90%, respectively for these conditions.[1-3] Though traditionally community health workers (CHWs) have been utilized to deliver a variety of services including health education, maternal health counseling, and medication monitoring (e.g. Directly Observed Therapy),[4] there has been an increasing emphasis on expanding the role of CHWs to address health workforce deficiencies. iCCM trains lay CHWs to assess, classify and treat uncomplicated cases of diarrhea, malaria and pneumonia and refer complicated or severe cases in areas that lack access to prompt and effective treatment due to patient level barriers such as lack of affordable transportation to the health facility, and health system level barriers including both direct and indirect costs.[3]

The implementation of iCCM has yielded mixed results in its impact on child pneumonia mortality. Early reports of the efficacy of community management of pneumonia in resource limited settings were promising with a meta-analysis from 1992 (and subsequent re-analysis using primary data in 2003) showing a statistically significant 30% decrease in total under-5 mortality in studies mostly from Asia.[5,6] Later studies

67 have validated that many iCCM programs incorporating pneumonia care performed well

68 on process measures[7-11] and outcomes[12] in the sub-Saharan African context. However,

69 other research has shown that many iCCM programs have not achieved decreases in

70 mortality and fail to perform on intermediate outcomes.[13-16] Especially troubling is the

71 result of a study in which adding pneumonia management to an existing program of

72 diarrhea and malaria community management led to no statistically significant reduction

73 in mortality in a well controlled randomized controlled trial.[15] Therefore, it is imperative to

74 perform research that assesses the efficacy and acceptability of iCCM programs.

75

76 African policy makers have been hesitant to integrate pneumonia care into the CHW

77 repertoire. In 2014 only 27 of 42 sub-Saharan African countries surveyed were providing

78 "complete" iCCM compared to 35 providing CCM for diarrhea and 32 for malaria.[17] A

79 recent meta analysis showed that one of the most important aspects of scalable

80 interventions with CHWs is community acceptance.[18] While some studies have

81 demonstrated that iCCM interventions are acceptable to the community [19,20] others have

82 shown that programs are resisted if CHWs do not provide services of value.[21] This is

83 important because iCCM programs which have low utilization-and likely low acceptance

84 of services are the least cost-effective, do not lead to decreases in mortality and may

85 decrease demand for biomedical healthcare leading the most marginalized to seek care

86 from ineffective providers.[1,22] In the current study, we sought to determine the level of

87 community acceptance of CHWs capacity to diagnose and treat sick children with

88 pneumonia at the community level when compared to facility based health care workers

89   in western Kenya. Building on the work of other groups in East Africa,[23] we utilized an

90   adapted version of the Primary Care Assessment Survey[24] to evaluate perceptions of

91   caregivers who sought medical attention for their children with pneumonia.

92

93   **MATERIALS AND METHODS**

94   **Study design**

95   The current study was a cross-sectional survey of caregivers of children age 2-59

96   months visiting CHWs and facility based health workers (FBHWs) for management of

97   pneumonia (fast breathing and lower chest in-drawing). It was nested within an

98   implementation science project occurring in Homabay County, Kenya in which CHWs

99   were trained to administer oral rehydration salts and zinc for diarrhea, artemisinin

100 combination therapy for malaria, and oral amoxicillin for pneumonia (fast breathing and

101 chest in drawing). This parent study was commissioned by the Kenya Ministry of health,

102 supported by the WHO and UNICEF, and registered as ACTRN12614000208606.

103

104 **Setting**

105 The study was conducted between June and August 2014 in Homabay County in

106 western Kenya. Homabay County has 6 administrative sub-counties: Homabay, Ndhiwa,

107 Mbita, Suba, South and North Rachuonyo. It is a rural county with a population of

108 approximately one million. Children under 5 years account for 16% of the population.[25]

109 Under 5 mortality in Homabay is 130/1000 compared to the Nyanza average of

110 91/1000.[26] The most serious barriers to the availability of child health services in

111   Homabay are related to inadequate human resources. These include prolonged waiting

112   times, poor communication between staff and patients and negative previous

113   experiences.[27] Despite an adequate number of health facilities, Homabay county suffers

114   from inequities in health worker distribution. Even though there are an average of 4

115   doctors and 51 nurses per 100,000 populations 58% of residents have to travel at least

116   5 kilometers to the nearest health facility.[28-30] To address the inequitable provision of

117   services and the high under5 mortality, Homabay was selected to receive an iCCM

118   intervention. Homabay has implemented the community strategy for primary care with

119   full coverage of community health units including over 2,600 CHWs and 200 community

120   health extension workers (CHEWs) who have been trained in iCCM. Each CHW covers

121   50-100 households while 10-20 CHWs are supervised by one CHEW.[29]

122

123   **Participants**

124   Study participants were caregivers whose children, age 2-59 month, had received

125   treatment for pneumonia from a CHW or FBHW in the past 8 weeks. To identify

126   caregivers of children treated by CHWs, we used an online registry that tracked all CHW

127   diagnosis, care and treatment of children. For FBHW treated children, facility based

128   registers were reviewed. Caregivers were then traced by trained research assistants

129   who also administered surveys.

130

131   **Sample Size**

132 Estimates of the attainable sample size and power calculations for this study were

133 based on historical data from the iCCM program with a pneumonia prevalence of 8.6%

134 and a monthly incidence of 2.0%. Approximately 130 children with pneumonia are seen

135 in the community per month per sub-county in this program. The estimated sample size

136 was 392 caregivers whose children were treated by CHWs and FBHWs with an equal

137 number (196) in each category. This sample size gave us 80% power to be able to

138 detect a 15% difference between perceived quality of care between CHWs and FBHWs.

139

140 **Sampling**

141 Eligible caregivers from both the online and facility based registers were purposively

142 sampled and asked to participate in a one-on-one quantitative interview. Facilities were

143 matched to community units from which caregivers who sought treatment at CHWs

144 were sampled.

145

146 **Data collection**

147 We used the Primary Care Assessment Survey (PCAS) instrument to collect data. The

148 PCAS is a validated tool comprised of Likert-scale questions designed to assess the

149 attitudes of patients and caregivers of patients towards primary care practitioners in a

150 number of domains.[24] Trained research assistants administered the surveys in the

151 preferred language of the caregiver (either Dholuo, Kiswahili, or English). To minimize

152 bias, the same research assistant administered both the CHW and FBHW surveys

153 when possible.

Main Outcome Variables

The main outcome of this study is perceived quality of care as measured by the PCAS. Previous studies have shown that a high perceived quality of care is associated with an increased utilization of services and therefore acceptability.[31] The PCAS measures caregivers perceptions of the quality of primary care through 10 different domains, including detailed measurement of the provider-patient relationship (communication quality, patient trust, provider knowledge of patient, interpersonal treatment, and relationship duration). For this study, we have grouped these 10 domains into 3 general categories of Accessibility, Clinical Care and Patient Relationships (**Table 1**). The category of Accessibility includes the domains of organizational access, financial access, visit based continuity and longitudinal continuity. The category of Clinical Care includes the domains of preventive counseling (measured by number of health messages delivered) and physical exam. The category of Patient Relationship includes the domains of interpersonal treatment, communication, trust and patient knowledge. Additionally 2 summary scale variables were assessed: the self-reported satisfaction of the caregiver and a domain summary that is an average of all domains excluding longitudinal continuity due to heterogeneity of this variable due to surveyor error.

Statistical methods

PCAS domain raw scores were calculated, missing scores imputed, and scaled scores calculated using guidelines from the original PCAS study.[24] Missing scores were imputed for all domains where at least 50% of their total component questions were

176 answered. The mean score of the completed questions was assumed for the missing

177 components and an imputed score calculated. Socio-demographic variables were

178 analyzed by performing statistical tests for all variables between the CHW and FBHW

179 groups. Principle component analysis based on assets was utilized to compute the

180 socio-economic status of the surveyed respondents as previously described.[32]

181

182 Comparisons of PCAS domain scaled scores were performed using Wilcoxon Mann

183 Whitney-Tests to compare medians between CHW and FBHW provided care. A model

184 was constructed to examine difference in domain ratings between CHW and FBHW

185 provided care while controlling for possible confounders. The factors of time since last

186 visit, socioeconomic status, caregiver education, caregiver sex and geographic location

187 were determined as covariates *a priori* to include in this analysis. Domain scores were

188 dichotomized using a median split and a modified Poisson regression with robust error

189 variance was utilized to determine incidence rate ratios (IRR) for receiving "high"

190 domain scores given CHW care. IRRs greater than one suggest CHW superiority,

191 values equal to one suggest equivalence between CHWs and FBHWs, and values less

192 than one suggest FBHW superiority. This method was preferred over logistic regression

193 as the outcomes were, by definition, non-rare.[33]

194

195 **Ethical clearance**

196 The study protocol was reviewed and approved by the Kenya Medical Research

197 Institute (KEMRI) National Ethical Review Committee (ERC), as well as the University of

198   California San Francisco (UCSF) Committee for Health Research (CHR). Written

199   consent in the preferred local language was obtained from caregivers of children prior to

200   any study procedure.

201

202   **RESULTS**

203   Caregivers selected from all 6 sub-counties of Homabay participated in the study with

204   194 receiving care from a CHW and 174 receiving care from an FBHW. Two surveys

205   from the CHW and 6 in the FBHW group and were excluded due to incomplete data

206   caused by a communication error with our survey software. Additionally, one survey in

207   the FBHW group was excluded due to the child being older than 59 months. This

208   yielded a total of 192 surveys in the CHW group and 167 in the FBHW group that were

209   analyzed. Of the overall sample, 157/192 (82%) of the CHW group and 101/167 (61%)

210   of the FBHW group contained data for all domain score variables. In both groups,

211   incomplete data was mostly due to missing data for the Longitudinal Continuity domain

212   with 35 missing in the CHW and 56 missing in the FBHW groups. Data were imputed for

213   domain scores in 22/192 (12%) of the CHW group and 34/167 (20%) of the FBHW

214   group. This difference was statistically significant by chi-square test ($p < 0.02$).

215

216   **Socio-demographic characteristics and Access Indictors**

217   As shown in **Table 2**, characteristics of caregivers and children were similar across both

218   groups in terms of caregiver sex, caregiver age, caregiver education, socio-economic

219   status, child sex, and child age. Differences were seen in the relationship of the

220   caregiver to the child (p<0.004), caregiver religion (p<0.002), and father's occupation

221   (p<0.022) by chi-squared tests.

222

223   Caregivers whose children received care from CHWs showed statistically significantly

224   improved access to care from their health professional across a number of indicators

225   (**Table 3**) including travel time (p<0.001), operating hours (p<0.001), waiting time

226   (p<0.001), expense of the visit (p<0.002) and expense of the drugs (p<0.001).

227

228   **Bivariate analysis: Differences in perceived quality of care between CHW and**

229   **FBHW Care**

230   Differences in all domains were statistically significant in all cases (p<0.001 for all

231   comparisons) with CHWs being rated more highly than FBHWs. Larger differences in

232   means were seen in variables related to access to care and patient relationships than in

233   clinical care (**Table 4**).

234

235   **Poisson Regression Model: Differences in perceived quality of care between**

236   **CHW and FBHW Care**

237   Our multivariate analysis using a more stringent modified Poisson regression (**Table 5**)

238   showed that CHWs still outperformed FHBWs in most areas with IRRs greater than one,

239   indicating a higher perceived quality of care for CHWs. CHWs were rated more highly in

240   terms of financial access (IRR: 7.15, 95% Confidence interval [CI]: 4.65-11.00,

241   P<0.001), organizational access (IRR: 4.92, 95% CI: 3.55-6.80, P<0.001)), self-reported

242   satisfaction (IRR 1.62, 95% CI: 1.34-1.97, p<0.001) and the domain summary (IRR

243   1.50, 95% CI: 1.43-1.59, p<0.001). However, the outcomes related to the provision of

244   clinical care—preventive counseling (IRR: 1.33, 95% CI 0.96-1.83, P=0.081) and

245   physical exam (IRR: 1.18, 95% CI: 0.93-1.50, P=0.170)—showed no statistically

246   significant difference between groups.

247

248   **DISCUSSION**

249   The data presented here allows for a robust examination of community perception of

250   quality of pneumonia home case management in western Kenya. Overall, caregivers

251   rated the quality of CHW provided home-based management for childhood pneumonia

252   higher than FBHW provided care.

253

254   Caregivers rated CHWs higher in regards to ease of access. This is likely because of

255   both the spatial distribution of CHWs, as they live in the community and therefore are

256   closer to clients, and the fact that CHWs don't charge user fees for care or medications.

257   Studies have found that utilization of healthcare services decreases with increasing

258   travel time and cost of services.[34,35] Though Kenya has implemented a policy to

259   decrease user fees,[36] especially for the poorest Kenyans, there is a lack of adherence

260   to this policy.[37] And, there are still many indirect costs associated with seeking care

261   from a health facility such as the cost of transportation, food, and foregone work.[35]

262   Home case management by well-trained well-supplied CHWs may be one way to

263   expand access to care to this population. Though we found no difference in SES

264   between the caregivers who utilized CHWs and FBHWs to access care, CHWs were

265   rated highly in accessibility across all income levels (data not shown) arguing that

266   economically vulnerable populations consider them accessible.

267

268   CHWs were rated more highly than FBHWs in their ability to communicate with

269   caregivers and instill trust. Patients answered positively when asked about the integrity,

270   friendliness and support in decision-making by CHWs. The ability to enter a therapeutic

271   relationship with the patient is important as both fear of stigma and perception of poor

272   quality care were associated with decreased utilization of iCCM in Ethiopia.[38] This high

273   satisfaction with CHWs is consistent with task shifting literature in HIV which has found

274   that clients receiving treatment from less trained staff are highly satisfied with their care

275   as they feel more supported by providers that are more relatable.[39] Additionally, more

276   trust in providers is associated with better adherence to medication for chronic

277   conditions such as hypertension.[40] Therefore, CHWs may play an important role in

278   ensuring that caregivers follow recommendations for medical treatment for their

279   children. This is consistent with a recent study in Ethiopia that found adherence rates of

280   84% for trimethoprim/sulfamethoxazole prescriptions dispensed by CHWs.[41] Antibiotic

281   resistance is a concern both in the in setting of home-based treatment of pneumonia as

282   well as clinic prescribed therapy.[42] However, resistance levels will be lower if all courses

283   of antibiotics are completed due to high adherence rates.[43]

284

285 In the present study, CHWs delivered a similar number of counseling messages

286 compared to FBHWs. Studies in other areas, such as sex education, have established

287 the role of peers in helping to set norms even when they are less expert on an issue.[44]

288 The idea of a trusted CHW peer being the most appropriate conveyor of health

289 education and counseling messages is not new.[4] However, continued study of the effect

290 of increasing professionalization of CHWs on their ability to relate to community

291 members and provide effective peer counseling will be necessary moving forward.

292

293 Even in regards to clinical skills, the area in which FBHWs have a clear advantage,

294 caregivers rated CHWs and FBHWs equally. Though a lack of clinical skill is one of the

295 main reasons cited by professional health workers not to support task shifting,[45,46]

296 caregivers did not perceive such a decrease in care quality. One explanation could be

297 that CHWs simply spend more time with the patients and are therefore able to perform a

298 more thorough evaluation. In the environment of a busy clinic, trained health

299 professionals often spend very little time with the patient. One study of a health center in

300 Kenya showed that of a 2 hour 25 minute total clinic visit (including wait time, check in

301 and time with the clinician), less than 10 minutes was actually spent with a clinician.[47]

302 From a patient perspective, this would stand in stark contrast to a visit with a CHW

303 where the entirety of the time was spent with the provider. Additionally, it has been

304 shown that FBHWs often do not adhere to the Integrated Management of Childhood

305 Illness (IMCI) guidelines (which parallel iCCM guidelines) due to either a lack of belief in

306 their validity or "cognitive overload" due to time pressure.[48] Mature iCCM programs have

307 achieved a consistency with guidelines of approximately 70% while studies of IMCI in a

308 variety of facilities have only demonstrated a maximum of 30% consistency.[48-50]

309 Therefore, caregiver faith in CHW ability may be well placed.

310

311 In terms of overall satisfaction, CHWs were preferred to FBHWs when examining either

312 a self-reported satisfaction score (a component of the PCAS) or a summary score that

313 was calculated as the mean across all PCAS domains indicating acceptability. This is in

314 line with many other studies that have shown the acceptability of community case

315 management of disease starting with diarrhea and malaria[51-53] and more recent

316 research on iCCM including pneumonia care.[19,20] This is likely because the CHWs in

317 this program have been providing services which are considered valuable to the

318 community.[21] Previous work has demonstrated the availability of drugs as an

319 exceedingly important component of iCCM interventions. If CHWs are not adequately

320 supplied, the community sees them as useless.[14] Additionally, conflicts can arise

321 between health facilities and CHWs if they are receiving drugs from a common source,

322 with the result often being that CHWs are forced to go without.[54] In the current study, the

323 supply of amoxicillin was highly prioritized (with sufficient stock given to both facilities

324 and CHWs) to limit stock-outs and may have contributed to the perceived utility of these

325 CHWs—they were able to perform the duties expected of them by the community.

326

327 Finally, individuals who sought care with CHWs were more likely to practice African

328 traditional religion. This is noteworthy as previous work has shown that members of this

329   group are less likely to access care for a variety of conditions.[55,56] This may be because

330   some African traditional religions place stigma on seeking biomedical healthcare.[55] The

331   ability to discreetly seek care from a CHW may ameliorate this barrier as it can be seen

332   as simply talking to a neighbor rather than receiving biomedical treatment. This is

333   analogous to previous efforts to encourage exclusive breast feeding for HIV-positive

334   women as a means to prevent vertical transmission so that they are able to be more

335   circumspect about revealing their status.[57] Therefore, CHW's may be an effective way to

336   increase the provision of biomedical care to individuals otherwise wary of it.

337

338   The strength of this study was the evaluation of specifically community case

339   management of pneumonia in a population of CHWs implementing community case

340   management of malaria and diarrhea. Limitations to this study include an inability to

341   qualitatively describe differences in ratings between CHW and FBHW provided care. A

342   mixed methods approach may have yielded more robust data. In addition, cross

343   sectional studies have an inherent tendency to exhibit bias because of systematic

344   differences between groups. However, we attempted to mitigate this by matching our

345   data both spatially and temporally. The data from this study were collected by program

346   research assistants and therefore may have suffered from desirability bias. However,

347   because the same individuals administered both the CHW and FBHW surveys this

348   potential bias should be equally distributed. Though all cases of pneumonia treated by

349   CHWs met previously defined iCCM diagnostic criteria, the cases treated by FBHWs

350   were identified solely by facility register review. This could mean there were clinical

351   differences between the two groups. However, there were no serious adverse events

352   (such as death) in either group, and children's symptoms were similar in both group

353   (**Table 2**). Additionally, the purpose of the study was only to determine caregiver

354   satisfaction, therefore the effect of this difference in case identification on outcomes of

355   interest was likely small. Finally, caregivers were only asked to participate in the study if

356   their children had received care in the past 8 weeks in order to reduce recall bias.

357

358   Overall, this study presents a strong case for the implementation and scale up of the

359   treatment of pneumonia as part of iCCM. Caregivers of children under-five find CHW

360   provided care for pneumonia both readily accessible and of high quality. By increasing

361   access to lifesaving pneumonia care in a culturally sensitive way in the most under-

362   resourced settings, large impacts on under-five mortality may be achieved.

363

371

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570   **Table 1: PCAS Domain Score Definitions**

Category	Domain Scale	Content
Accessibility	Organizational Access	Availability of staff and services and convenience of location of health services
	Financial Access	Measure of the amount of money spent on treatment
	Longitudinal Continuity	Duration of contact between health provider and client
	Visit Based Continuity	Ongoing care for the same period of illness
Clinical Care	Preventive Counseling	Discussion of preventive health measures with client
	Physical Exam	Thoroughness of physical exam
Patient Relationship	Communication	Ability to probe for symptoms, give feedback and assist in making treatment decisions
	Interpersonal Treatment	Patience, friendliness, respect of patient, and giving quality time to a patient
	Trust	Integrity and role of provider as patient's agent
	Patient Knowledge	Provider knowledge of patient
Summary Scores	Self-Reported Satisfaction	Caregivers overall satisfaction with the visit
	Domain Summary	Average score across all domains

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Table 2: Socio-demographic characteristics of caregivers and children

Characteristic	CHW Care No (%)	FBHW Care No (%)	p-value
Caregiver Sex			p=0.827
Female	176 (92)	152 (91)	
Male	16 (8)	15 (9)	
Total	192	167	
Caregiver Age Mean(SD)	29 (8.2)	29.3 (9.1)	p=0.924
Total	191	167	
Caregiver Relation—no(%)			p=0.004
Mother	173 (90)	132 (79)	
Father	12 (6)	14 (8)	
Other	7 (4)	21 (13)	
Total	192	167	
Caregiver Religion—no(%)			p=0.002
Christian	159 (83)	155 (93)	
Traditional Religion	21 (11)	7 (4)	
Muslim	3 (1)	0 (0)	
Other	9 (5)	5 (3)	
Total	192	167	
Socioeconomic Status—no. (%)			p=0.250
Lower 1/3	67 (36)	47 (31)	
Middle 1/3	65 (35)	48 (31)	
Upper 1/3	55 (29)	58 (38)	
Total	187	153	
Caregiver Education—no. (%)			p=0.374
Some Primary	136 (71)	110 (66)	
Secondary	48 (25)	45 (26)	
University/ College	2 (1)	6 (4)	
Other	6 (3)	6 (4)	
Total	192	167	
Father's Occupation			p=0.022
Day Laborer	32 (17)	23 (14)	
Farmer	68 (35)	37 (22)	
Fisherman	14 (7)	15 (9)	
Institutional Employee	8 (4)	8 (5)	
Small Businessman	28 (15)	31 (19)	
Unemployed	17 (9)	33 (19)	
Other	25 (13)	20 (12)	
Total	192	167	

Child Sex			p=0.714
Female	94 (49)	85 (51)	
Male	98 (51)	82 (49)	
Total	192	167	
Child Age			p=0.207
2-12mo	58 (31)	37 (23)	
13-36mo	90 (48)	81 (50)	
36-60mo	40 (21)	43 (26)	
Total	188	161	
Child Symptoms			N/A
Cough	192 (100)	162 (97)	
Fever	153 (80)	141 (84)	
Fast Breathing	124 (65)	135 (81)	
Watery Stools	27 (14)	15 (9)	
Other	9 (5)	22 (13)	

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574 **Table 3: Access Indicators**

Characteristic	CHW—no. (%)	FBHW—no. (%)	p-value
Travel Time—			p<0.001
<30 min	163 (85)	44 (26)	
0.5-1hr	27 (14)	91 (55)	
1-2 Hours	2 (1)	28 (17)	
>2 hours	0 (0)	4 (2)	
Total	192	167	
More Operating Hours Needed			
No	131 (71)	44 (27)	p<0.001
Yes	54 (29)	116 (73)	
Total	185	160	
Waiting Time			p<0.001
None	120 (63)	6 (4)	
<5 min	59 (31)	14 (8)	
6-30 min	13 (7)	112 (68)	
>30 min	0 (0)	34 (20)	
Total	192	166	
Visit Expensive?			p=0.002
No	174 (91)	127 (80)	
Yes	17 (9)	33 (20)	
Total	191	160	
Drugs skipped due to cost?			p<0.001
No	191 (99)	142 (85)	
Yes	1 (1)	24 (15)	
Total	192	167	

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Table 4: Bivariate analysis: Differences in perceived quality of care between CHW and FBHW Care

Characteristic	CHW-Mean(SD)	CHW-Median(IQR)	FBHW-Mean(SD)	FBHW-Median(IQR)	p-value*
Financial Access	90 (11)	100 (80-100)	44 (25)	40 (20-60)	p<0.001
Organizational Access	82 (13)	80 (73-93)	46 (24)	40 (27-60)	p<0.001
Visit Based Continuity	97 (10)	100 (100-100)	75 (25)	80 (60-100)	p<0.001
Longitudinal Continuity	75 (25)	75 (50-100)	54 (24)	50 (50-75)	p<0.001
Patient Knowledge	77 (13)	77 (69-85)	64 (23)	64 (44-77)	p<0.001
Preventive Counseling	87 (18)	100 (67-100)	75 (31)	100 (67-100)	p<0.001
Physical Exam	79 (14)	80 (60-80)	68 (23)	60 (60-80)	p<0.001
Communication	81 (12)	81 (75-90)	67 (20)	63 (52-83)	p<0.001
Interpersonal Treatment	83 (10)	80 (80-88)	65 (21)	60 (48-80)	p<0.001
Trust	77 (10)	75 (71-82)	73 (12)	71 (64-82)	p<0.001
Domain Summary	84 (7)	83 (79-88)	65 (16)	65 (54-75)	p<0.001
Self-Reported Satisfaction	88 (12)	80 (80-100)	78 (19)	80 (60-100)	p<0.001

*All p-values are based on the Wilcoxon Mann-Whitney comparison of medians

Table 5: Poisson Regression Model: Differences in perceived quality of care between CHW and FBHW Care

Characteristic	Unadjusted-IRR*(CI)	p<value	Adjusted IRR(CI)	p-value
Financial Access	7.73 (4.90-12.20)	p<0.001	7.15 (4.65-11.00)	p<0.001
Organizational Access	5.09 (3.61-7.18)	p<0.001	4.92 (3.55-6.80)	p<0.001
Visit Based Continuity	2.04 (1.44-2.90)	p<0.001	2.31 (1.63-3.29)	p<0.001
Longitudinal Continuity	2.38 (1.63-3.46)	p<0.001	2.30 (1.57-3.36)	p<0.001
Patient Knowledge	2.26 (1.76-2.91)	p<0.001	2.44 (1.95 -3.05)	p<0.001
Preventive Counseling	1.23 (0.88-1.72)	p=0.218	1.33 (0.96-1.83)	p=0.081
Physical Exam	1.20 (0.93-1.56)	p=0.153	1.18 (0.93-1.50)	p=0.170
Communication	1.98 (1.57-2.50)	p<0.001	1.91 (1.53-2.38)	p<0.001
Interpersonal Treatment	2.21 (1.69-2.90)	p<0.001	2.10 (1.63-2.71)	p<0.001
Trust	1.30 (1.05 -1.62)	p=0.015	1.32 (1.07 -1.63)	P=0.010
Domain Summary	1.49 (1.41-1.59)	p<0.001	1.50 (1.43-1.59)	p<0.001
Self-Reported Satisfaction	1.63 (1.34-1.99)	p<0.001	1.62 (1.34-1.97)	p<0.001

*The Incidence Rate Ration (IRR) is the probability of being in the top 50% of all scores given seeking care from a CHW. Therefore, IRRs above one suggest CHW superiority, IRRs at one suggest equivalence between CHWs and FBHWs and IRRs below one suggest FBHW superiority. The adjusted model controls for time since last visit, socioeconomic status, caregiver education, caregiver sex and geographic location

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