

A Community Intervention to Improve Blood Pressure Control in a Developing Country

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Study Overview

Objective. To test the effectiveness of using home health workers and trained general practitioners on reducing high blood pressure.

Design. Cluster randomized 2 × 2 factorial controlled trial.

Setting and participants. The investigators conducted this trial in 12 randomly selected communities in Karachi, Pakistan. They used a multistage random sampling technique to select 12 communities out of 4200 low- and middle-income clusters (~ 250 households in each), each spaced out by at least 10 km. A total of 3 randomly selected clusters received general practitioner (GP) training around hypertension, 3 received community health worker home health education (HHE) for hypertension self-management, 3 received both GP and HHE interventions, and 3 received none. Participants included people 40 years or older living in the selected clusters with known hypertension or elevated blood pressure above 140/90 mm Hg on multiple readings. Pregnant women, bed-bound people, and those who could not consent were excluded. The study staff trained 6 community health workers to provide HHE around the importance of controlling hypertension through diet, exercise, smoking cessation, and physician treatment. The first HHE session was conducted for the entire household and lasted 90 minutes; subsequent 30-minute visits occurred every 3 months for the next 2 years of the study. The investigators invited the GPs in the 6 randomly chosen clusters to receive additional training regarding hypertension counseling and medication management. At least two-thirds of GPs in each area received a day-long, case-based, and evidence-based training session. They were not remunerated for their time.

Main outcome measures. The key outcome measure was change in systolic blood pressure from baseline to last follow-up visit. The study's secondary outcome was the proportion of participants with controlled blood pressure (< 140/90 mm Hg) at last follow-up visit. The investigators utilized an intention to treat analysis and also tested for interaction effects among the treatment groups.

Main results. The evaluators enrolled a total of 1341 patients

(37.4% men) with a mean age of 53.8 years and mean systolic blood pressure of 151.7 mm Hg. Mean blood pressure, proportion with controlled hypertension, and all other variables measured at baseline were similar among the 4 groups except for mean age ($P = 0.026$). At the end of 2 years, blood pressure readings were not available for 297 participants (22% of total), although the distribution of participants with missing end visit blood pressure readings was not different between the 4 groups. Systolic blood pressure decreased among all 4 treatment groups. After adjusting for age, sex, and baseline systolic blood pressure, the decrease in systolic pressure was significantly larger in the HHE+GP intervention group (10.8 mm Hg [95% confidence interval (CI), 8.9–12.8 mm Hg]) compared with the HHE only, GP only, or no intervention clusters (5.8 mm Hg [95% CI, 3.9–7.7 mm Hg]; $P < 0.001$). The investigators found a significant interaction between the main effects of GP training and HHE for the change in systolic blood pressure ($P = 0.004$ for intention to treat, and 0.04 for per-protocol analysis). A statistically significant larger proportion of patients in the HHE + GP group achieved controlled systolic blood pressure (56.9%) compared with the other groups (23%–27.3%, $P = 0.003$). Among the HHE + GP participants, there were larger reductions in smoking ($P < 0.001$), increases in physical activity ($P = 0.03$), and higher rates of antihypertensive prescriptions ($P < 0.001$) compared with the other groups.

Conclusion. A community intervention consisting of home health visits by trained community health workers in addition to physician education about hypertension management improved blood pressure control for people with hypertension in urban Pakistan.

Commentary

Cardiovascular disease is now the leading cause of death in both the developed and developing world [1]. Hypertension causes the highest attributable proportions of death due to cardiovascular disease [2]. In 2001, nearly \$370 billion were spent globally on the direct health care costs of suboptimal blood pressure, representing 10% of total health expenditures [3]. Over a 10-year period, these direct costs are projected to grow to over \$1 trillion, with indirect costs as high as \$3.6 trillion [3]. Current projections predict that the epidemic

of hypertension and cardiovascular disease will continue unabated particularly throughout the developing world due to increases in tobacco use, sedentary lifestyles, obesity, and aging [1]. To date, however, few successful single-intervention trials of patient or provider education for hypertension management have been reported. Notably, though, multipronged interventions aimed at controlling hypertension in the community have shown early success [4].

This study sought to evaluate through a randomized factorial 2 × 2 clinical trial design whether a combination or singular strategy using physician education and/or trained community health workers could improve blood pressure control in a developing country community setting. After 2 years, the investigators found that a combined community health worker and physician strategy significantly reduced systolic blood pressure and doubled the proportion of hypertensive adults with controlled blood pressure.

This real-world effectiveness trial had some notable strengths. It appears to be the first population-based randomized controlled trial of educational strategies to improve hypertension control in South Asia, a region with a high burden of hypertension-related disease [1]. The trial was well-performed with excellent sampling strategies to ensure representative cluster recruitment and minimization of cluster contamination by keeping them at least 10 km apart. The study findings appear to be robust to multiple sensitivity analyses and with a 5-mm Hg decrease in systolic pressure, are clinically important. One study from the United States estimated that a 5-mm Hg reduction would translate to a nearly 20% absolute risk reduction in cardiovascular death over 20 years [5]. The trial investigators did not pay physicians nor provide medications; thus, the interventions were simple and scalable targeted education initiatives. Generalizability outside the urban Pakistani setting is likely possible, and the interventions appear to be feasibly integrated into the existing system. This potential integration is a key element of successful scalability, as free-standing vertical programs are unlikely to become longstanding parts of successful developing health systems [6].

A few key limitations were present in this study. First, over 20% of participants did not have blood pressure readings at the end of the study. While this is high, the proportion of missing data was similar in each group. This missing data highlights how difficult it is to perform real-world effectiveness trials in developing country settings. Second, change in blood pressure was used as a surrogate endpoint for a

more robust endpoint such as cardiovascular death. While data suggest a clear link between reduced blood pressure and cardiovascular death [5], the trial was too short and too small to show an effect on these more robust endpoints. Finally, the exact mechanism through which the trial interventions were successful remains unclear. The individual interventions did not show a difference, but their combination did. Whether this was through educational reinforcement or increased healthy behaviors is suggested but not proved through the study results.

Applications for Clinical Practice

A feasible strategy of community health worker hypertension education combined with general physician education appears to be a promising avenue for improving hypertension care in resource-poor settings across the globe. While further studies to replicate these findings in different locations are carried out, national governments and global health organizations should pilot these types of community interventions given their low cost and large potential benefit. Crossing the delivery and implementation gaps between well-funded research trials to large scaled up regional interventions will require thoughtful and creative multidisciplinary collaboration between policymakers, researchers, and health providers on the ground.

—Review by Asaf Bitton, MD

References

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