



PATIENTS' JUDGMENT ABOUT HYPERTENSION CONTROL DIFFERS AS A FUNCTION OF DATA VISUALIZATION TECHNIQUE

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BACKGROUND AND OBJECTIVE

- Uncontrolled hypertension is a significant global health risk
- Yet, multiple drugs exist to effectively treat this disease
- Shared data visualization techniques may help overcome clinical inertia by improving judgments about hypertension control
- As part of a larger project developing EMR data visualizations, we examined the effect of visualization type on patient judgments of hypertension control

METHODS

- Participants (N=78; Internet sample of patients with hypertension) reviewed visual displays depicting blood pressure (BP) data for fictitious patients
- Using a within-subjects design, participants reviewed 16 data displays that varied in: systolic BP mean (130, 145), systolic BP SD (15, 25), visualization type (Data table, Data table with statistics, Line graph, Line graph with linguistic summary)
- Line graphs included both the raw BP data and a smoothing function generated by a non-robust LOESS function
- For each data display, participants:
 - Rated perceived hypertension control and need for medication change (0-100)
 - Rated subjective risk of heart attack and stroke (1-10)
 - Recalled % of BP values out of target range

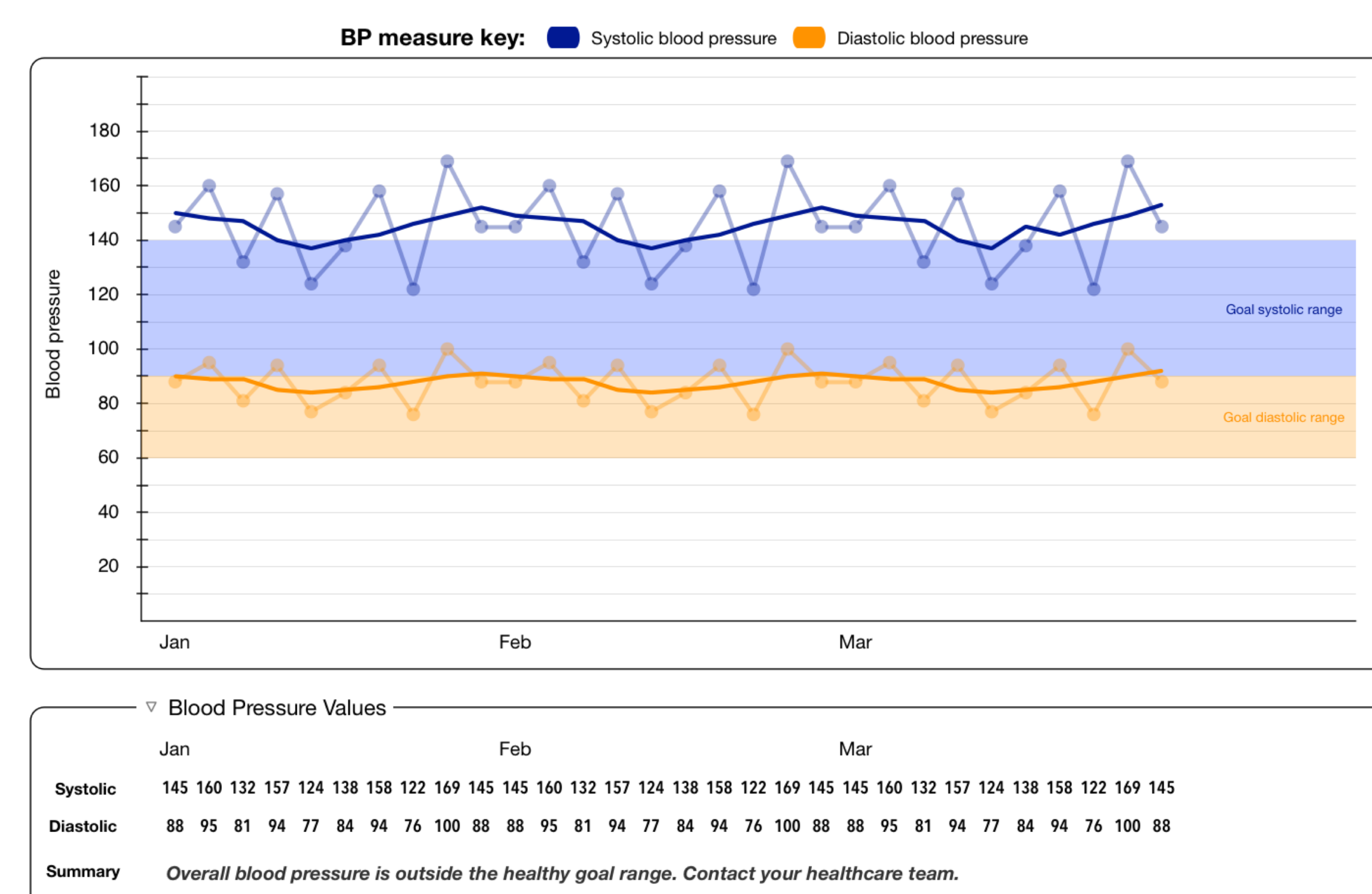


Figure 1. Line graph with linguistic summary

▼ Blood Pressure Values		Jan		Feb		Mar		Average		Range	
Systolic		145	160	132	157	124	138	158	122	169	145
Diastolic		88	95	81	94	77	84	94	76	100	88
Summary		Overall blood pressure is outside the healthy goal range. Contact your healthcare team.									

Figure 2. Data table with summary statistics

RESULTS

Sample Characteristics	
Characteristics	Study 1
N	78
Mean Age (SD)	57.17 (14.02)
Female, N (%)	48 (61.54%)
White, N (%)	63 (80.77%)
College Degree or Higher, N (%)	27 (34.62%)
Modal Income	\$10,000-29,999
Mean Subjective Numeracy (SD)	3.99 (0.98)

Preferences for Data Visualization Format, N (%)				
Item	Data Table	Data Table Plus	Line Graph	Line Graph Plus
Useful	9 (11.7%)	37 (47.4%)	9 (11.7%)	22 (28.6%)
Helpful	10 (13.0%)	32 (41.6%)	10 (13.0%)	25 (32.5%)
Trustworthy	10 (13.0%)	32 (41.6%)	10 (13.0%)	25 (32.5%)
Likely to Use	11 (14.3%)	29 (37.7%)	8 (10.4%)	29 (37.7%)
Preferred	10 (12.8%)	29 (37.2%)	8 (10.3%)	31 (39.7%)

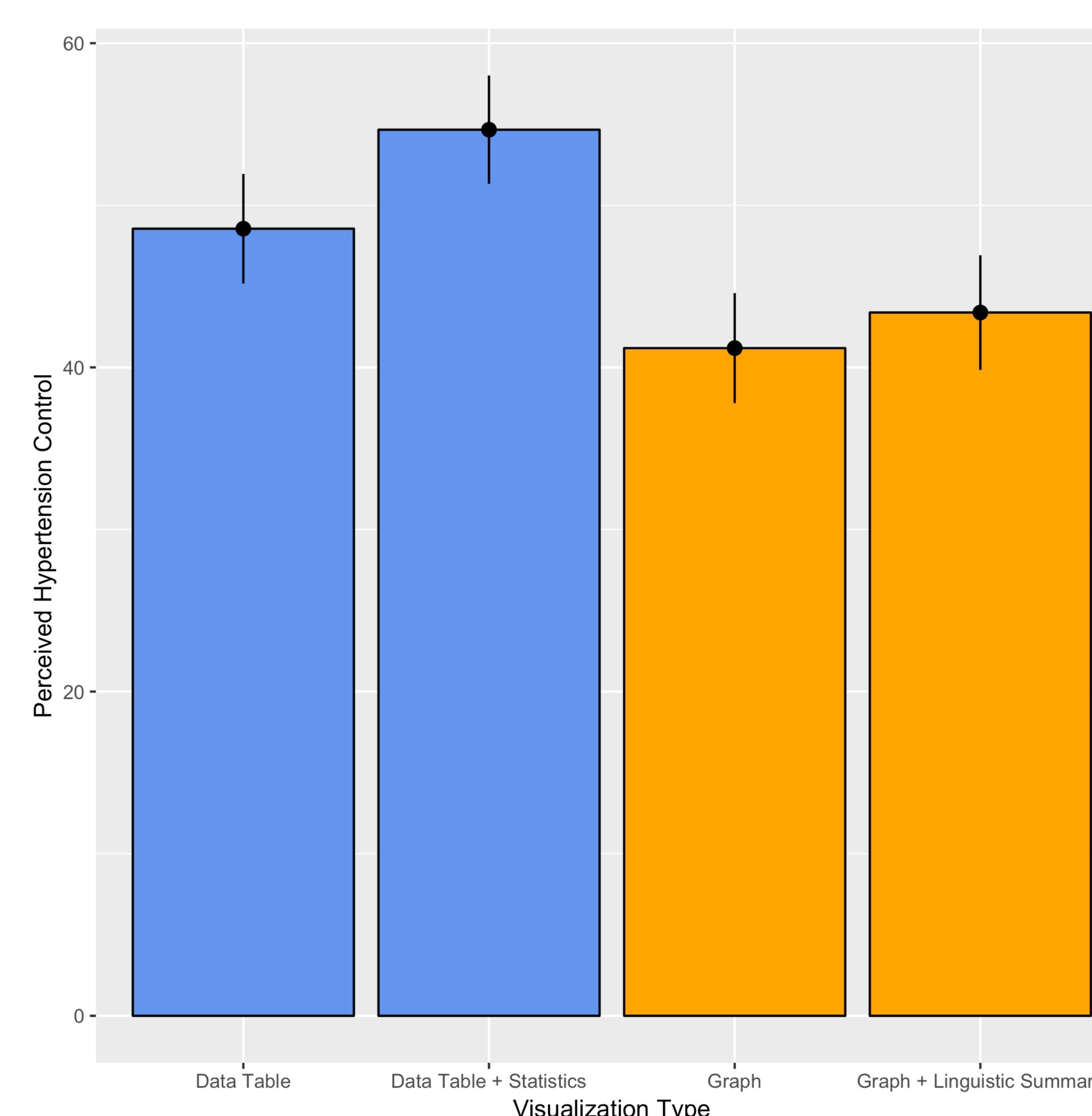


Figure 3. Relationship between Data Visualization Type and Perceived Hypertension Control

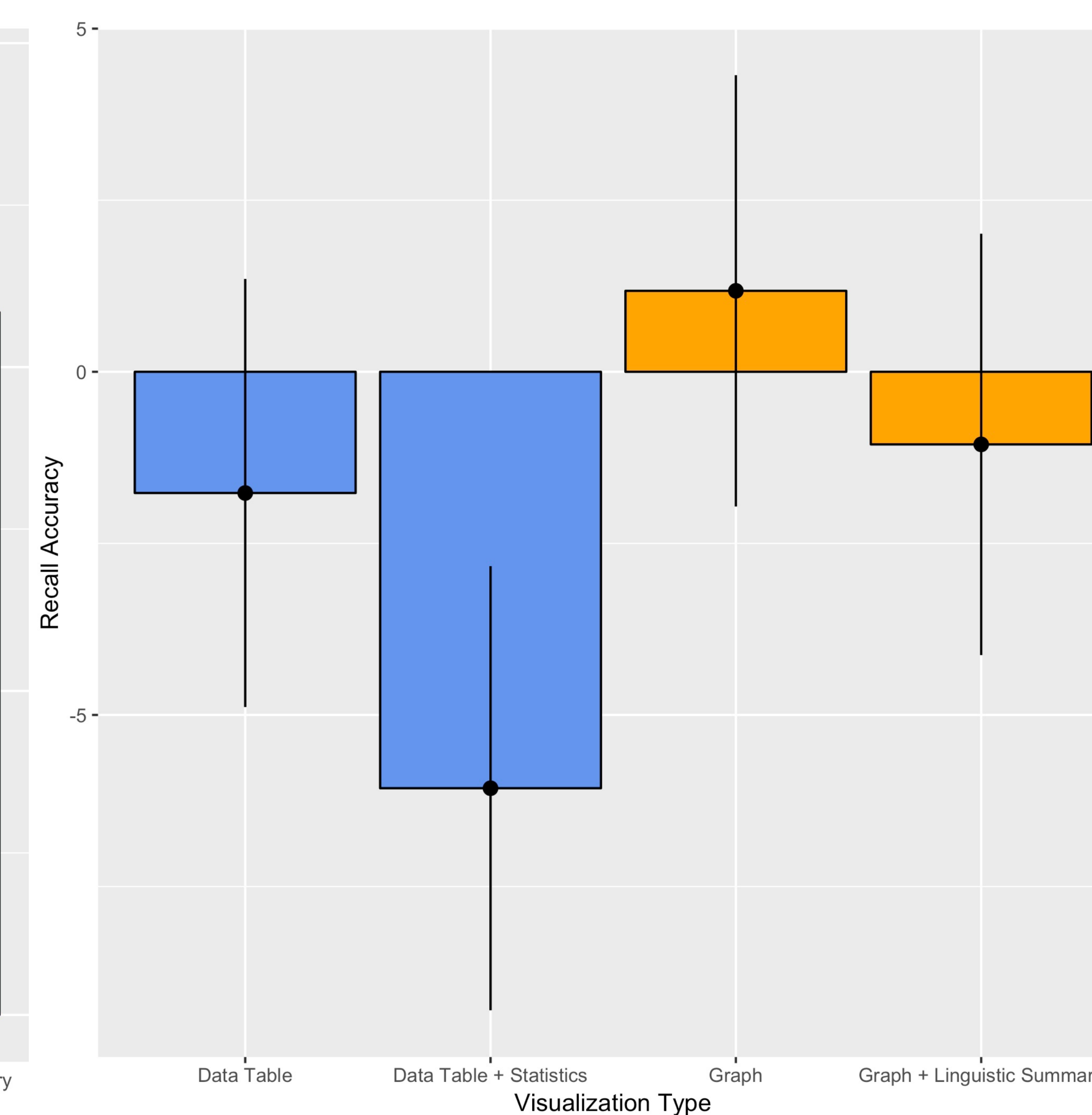


Figure 4. Recall Accuracy by Data Visualization Type

Effect of Data Visualization on Study Outcomes, M (SE)

Subscripts denote groups that differ significantly

Item	Data Table	Data Table Plus	Line Graph	Line Graph Plus	F Statistic	P-value
Hypertension control (0-100 scale)	48.55 (2.49) ¹	54.66 (2.70) ¹	41.19 (2.53) ²	43.39 (2.40) ²	14.08	<.001
Medication change (0-100 scale)	57.14 (2.43) ¹	49.50 (2.92) ¹	61.58 (2.54) ²	61.37 (2.35) ²	10.07	<.001
Heart attack risk (1-10 scale)	5.55 (0.21) ¹	5.04 (0.23) ¹	6.05 (0.21) ²	5.83 (0.20) ²	11.86	<.001
Stroke risk (1-10 scale)	5.65 (0.22) ¹	5.16 (0.24) ¹	6.20 (0.23) ²	5.95 (0.21) ²	12.26	<.001
Recall accuracy	-1.77 (2.63) ¹	-6.07 (2.91) ¹	1.18 (2.64) ²	-1.06 (2.55) ²	4.62	.004

DISCUSSION

- Main effects of BP mean, BP standard deviation, and data visualization type on all outcome measures
- Appropriately, patients deemed hypertension to be less controlled when visualizations depicted higher mean values and greater variability
- Importantly, patients also judged the same BP data presented in graphical form as less well controlled, at greater 10-year risk for heart attack and stroke, and in greater need of medication change compared to data presented in tabular form; Figure 3
- Yet, recall of the percentage of BP values out of target range was most accurate after viewing graphical representations and worst after viewing tabular representations; Figure 4

LIMITATIONS

- Participants were making judgments about hypertension control for other patients. Judgments made for the self may differ.
- Judgments were made without discussion with a physician. Interactions within a clinic setting may alter patient responses.
- The use of vignettes in a web-based study limit the generalizability of the results

CONCLUSIONS

- Data visualization had a significant impact on patient judgments about hypertension control, perception of risk, and recall of values out of range
- Graphical representations—more than tabular displays—may promote greater willingness to intensify medication
- Therefore, visualizing blood pressure data via line graphs may be a superior approach to data visualization for patients with uncontrolled hypertension
- Future research should examine the impact of data visualization on shared decision making and hypertension control in a clinic setting