Prospective Iterative Data Visualization Study to Enhance Health Literacy in Prostate Cancer

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Presented by: DE Spratt (Daniel.Spratt@UHhospitals.org) at the 2024 ASCO Annual Meeting; May 31 – June 4, 2024; Chicago, IL, USA

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KEY TAKEAWAY

This is one of the first prospective multistakeholder studies in PC to explore comprehension and preferences of data visuals from a diverse group of patients and caregivers. We provide a starting point to elucidate best practices for comparative effectiveness research data visualization for patients and caregivers

PC, prostate cancer

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INTRODUCTION

- Many patients with PC and caregivers struggle to interpret complex scientific data about PC treatments.[1] This hinders their ability to make informed treatment decisions[2]

- Methods used to visualize comparative effectiveness research can impact patient and caregiver understanding of PC treatments

- Demographic factors such as age, race, education level, and socioeconomic status are associated with health literacy and health disparities.[1,3] There is a need to identify ways to enhance data visualization with a focus on health literacy and socioeconomic considerations

- Our study objective is to evaluate the relative effectiveness of various data visualization methods in communicating key takeaways within a diverse group of patients with PC and their caregivers

[1]Daum LM, et al. *J Am Board Fam Med.* 2017;288-297. [2]Blödt S, et al. *BMJ Open.* 2018;8:e019576. [3]Woods NK, et al. *J Prim Care Community Health.* 2023;14:21501319231156132.
PC, prostate cancer

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METHODS

- A panel representing patient and advocate, industry, and healthcare provider viewpoints provided qualitative feedback on multiple comparative effectiveness research data visualization methods. The panel then generated an online survey for patients with PC and their caregivers

- Demographic quotas were set, and various recruitment channels were engaged, including direct recruitment from patient advocacy groups representing specific demographics, to create a sample that was diverse with respect to social determinants of health

- A total of 250 eligible respondents in the United States were identified by both a market research agency and a patient advocacy group (***Appendix***, available by scanning the QR code)

  - Patients (n=199) were aged ≥40 years and aware of their disease state. Caregivers (n=51) were aged ≥18 years and cared for a person with PC

- Respondents first reported on comfort with and understanding of scientific data on PC using Likert scales, and then evaluated a randomly assigned visual (1 of 2 versions of a visual each depicting the same data from comparative effectiveness research) for each of 4 topics:

  - Efficacy, PSA, safety, and QoL (***Appendix***)

PC, prostate cancer; PSA, prostate-specific antigen; QoL, quality of life; QR, quick response

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METHODS

- For each randomly assigned visual, respondents first wrote out their own (unaided) takeaway and then selected the best takeaway from 4 options (*Appendix*)

- Respondents then compared the 2 visuals for each of the 4 topics side by side and selected the visual for each topic that better communicates the key takeaway. The visuals selected from each of the 4 topics as better communicating the takeaway were displayed together as an overall story (for an example, see *Appendix*)
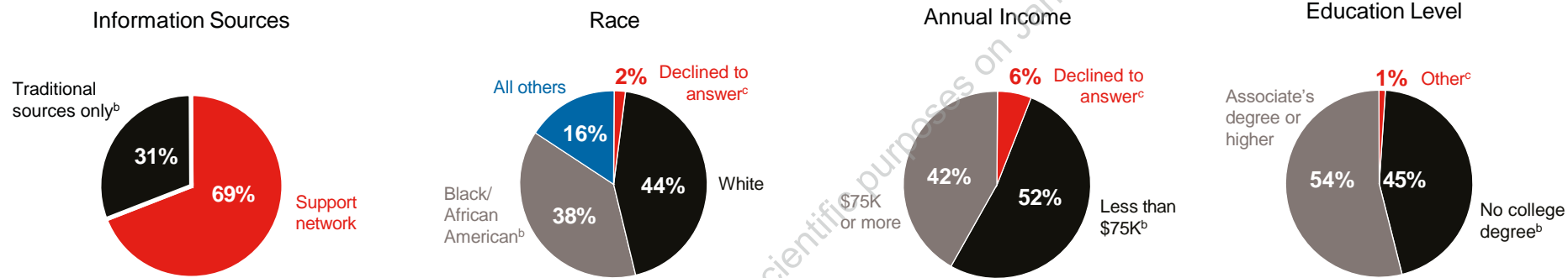
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RESULTS

- A total of 250 respondents participated between August and September of 2023; most (59%) respondents were aged ≥60 years; 66% reported having or caring for a patient with nonmetastatic PC

Respondents[a] represented a diverse group based on factors associated with health literacy

Information Sources — Traditional sources only[b] 31%, Support network 69%

Race — All others 16%, Declined to answer[c] 2%, White 44%, Black/African American[b] 38%

Annual Income — Declined to answer[c] 6%, $75K or more 42%, Less than $75K[b] 52%

Education Level — Other[c] 1%, Associate's degree or higher 54%, No college degree[b] 45%

- A sizeable percentage of respondents reported being uncomfortable/neutral toward PC scientific data (26%) or agreed that scientific data about PC are overwhelming (29%) or difficult to understand (35%)

[a]All categories were combined across patients and caregivers. [b]Groups typically associated with lower health outcomes or health literacy. [c]Groups excluded from analysis of that demographic category. PC, prostate cancer
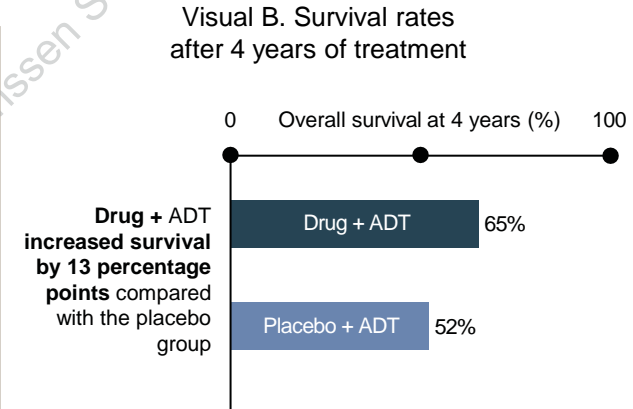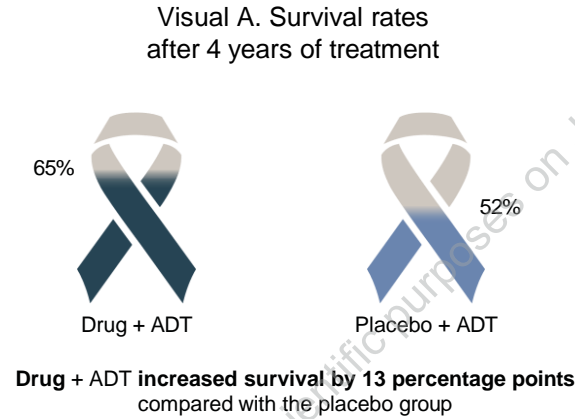
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RESULTS

Efficacy visuals

The efficacy visual of a bar graph was better understood and communicated than a visual based on ribbon imagery

Visual A. Survival rates after 4 years of treatment

65% Drug + ADT

52% Placebo + ADT

Drug + ADT increased survival by 13 percentage points compared with the placebo group

Visual B. Survival rates after 4 years of treatment

Overall survival at 4 years (%) 0 – 100

Drug + ADT increased survival by 13 percentage points compared with the placebo group

Drug + ADT 65%

Placebo + ADT 52%

Unaided key takeaway	Can live longer taking Drug + ADT	Can live longer taking Drug + ADT
% who chose correct takeaway aided[a]	81%	89%
Visual that better communicates takeaway	39%	61%
Summary of *why* respondent thought visual better communicates takeaway		*Visual B bar graph is more straightforward and easier to understand*

[a]Aided takeaway: More patients were alive after 4 years when taking Drug + ADT.
ADT, androgen deprivation therapy
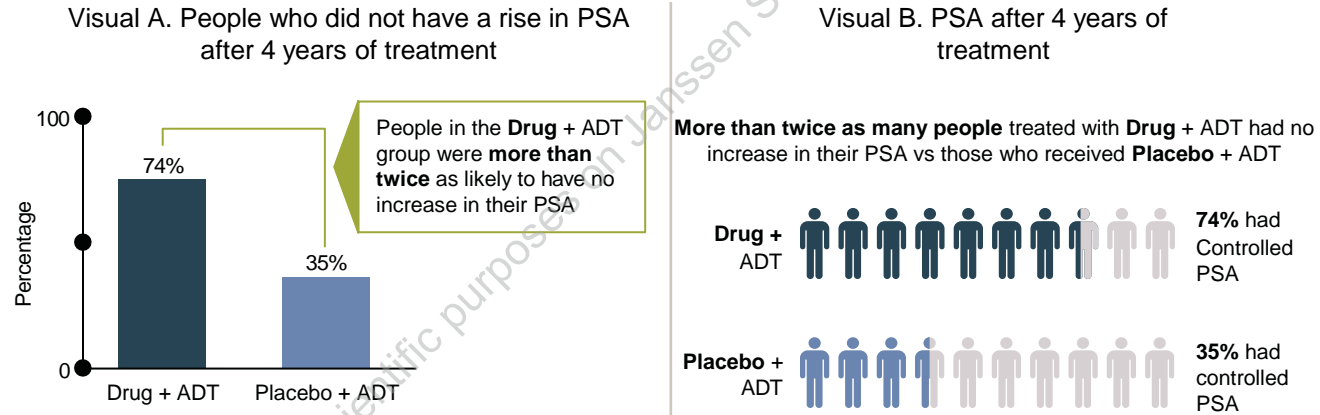
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RESULTS

PSA visuals

Although >70% of respondents identified the correct takeaway for 2 different visuals on PSA, most respondents reported that the imagery/person icons better communicated the takeaway

Visual A. People who did not have a rise in PSA after 4 years of treatment

People in the **Drug + ADT** group were **more than twice** as likely to have no increase in their PSA

Visual B. PSA after 4 years of treatment

More than twice as many people treated with **Drug** + ADT had no increase in their PSA vs those who received **Placebo** + ADT

Drug + ADT — **74%** had Controlled PSA

Placebo + ADT — **35%** had controlled PSA

Unaided key takeaway	Effective in controlling PSA level	Effective in controlling PSA level
% who chose correct takeaway aided[a]	72%	73%
Visual that better communicates takeaway	40%	61%
Summary of *why* respondent thought visual better communicates takeaway		*Visual B provides a human connection, not just numbers*

[a]Aided takeaway: With Drug + ADT, patients more than doubled their chance of NO increase in PSA after 4 years.
ADT, androgen deprivation therapy; PSA, prostate-specific antigen

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RESULTS

Safety visuals

Visual with emphasis on people without positive outcomes was better understood and communicated than a visual that emphasized people with negative outcomes

Visual A. Percentage of people without serious side effects

Most people **did not experience serious side effects** in either group

Drug + ADT — **92%** of people did not have serious side effects — 8%

Placebo + ADT — **97%** of people did not have serious side effects — 3%
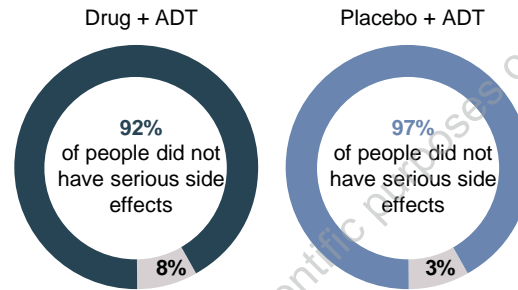
Visual B. Percentage of people with serious side effects

In both groups, **very few people experienced serious side effects**

Drug + ADT — **8%** of people did have serious side effects — 92%

Placebo + ADT — **3%** of people did have serious side effects — 97%
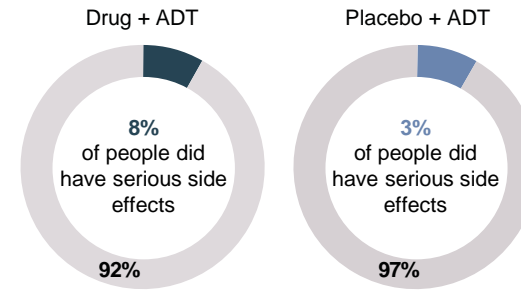
Unaided key takeaway	Very few side effects with drug	Very few side effects with drug
% who chose correct takeaway aided[a]	62%	37%
Visual that better communicates takeaway	67%	33%
Summary of *why* respondent thought visual better communicates takeaway	Visual A has a more positive outlook and its larger numbers have a bigger impact	

[a]Aided takeaway: Chances of serious side effects are similar between Drug + ADT and Placebo + ADT.
ADT, androgen deprivation therapy

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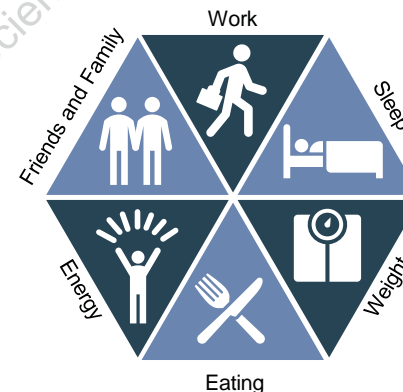
RESULTS

QoL visuals

Just over half of respondents chose the correct key takeaway for both visuals. Overall, respondents were divided as to which version of the visual best communicated the key takeaway

Visual A. Impact of additional treatment on QoL measures

The addition of Drug to ADT did not negatively impact patients' QoL (such as social life, work, sleep, weight, eating, and energy)

Drug + ADT QoL rating

Placebo + ADT QoL rating

Visual B. Impact of additional treatment on QoL measures

Work · Sleep · Weight · Eating · Energy · Friends and Family

Patients' **QoL stayed the same** over 4 years, even with the addition of **Drug** to ADT

Unaided key takeaway	Can have a normal life	Can have a normal life
% who chose correct takeaway aided[a]	59%	56%
Visual that better communicates takeaway	47%	53%
Summary of *why* respondent thought visual better communicates takeaway		*Visual B shows examples of QoL components and is more visually appealing*

[a]Aided takeaway: Adding the Drug to ADT did NOT make QoL worse.
ADT, androgen deprivation therapy; QoL, quality of life

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RESULTS

Interpretation of visuals

- For many visuals, there were no consistent, robust patterns of differences in accuracy of interpretation based on factors associated with health outcomes and health literacy, including income level, education, and race

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CONCLUSIONS

✓ Visuals with quantitative data showing treatment differences were more accurately interpreted and more effectively communicated the key takeaway than graphics without quantitative data

✓ Communicating differences between groups was more effective than communicating parity. For safety data, depicting positive outcomes was more effective than depicting negative outcomes

✓ Social determinants of health did not appear to have consistent, significant effects on accuracy of interpretation of the data visuals, especially for visuals that were well understood

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APPENDIX

REFERENCES:

1. Daum LM, et al. *J Am Board Fam Med*. 2017;288-297.
2. Blödt S, et al. *BMJ Open*. 2018;8:e019576.
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DISCLOSURES:

ACKNOWLEDGMENTS:

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APPENDIX

250 respondents[a] in the United States were included in the online survey

Eligibility criteria for participation in the survey were self-reported

Patients N=199	Caregivers N=51
Aged ≥40 years	Aged ≥18 years
Diagnosed with PC and aware of PC disease state	Caregiver for a person aged ≥40 years diagnosed with PC and aware of patient's PC disease state

[a]192 respondents were recruited by buzzback market research agency and 58 respondents were recruited by ZERO Prostate Cancer patient advocacy group.
PC, prostate cancer

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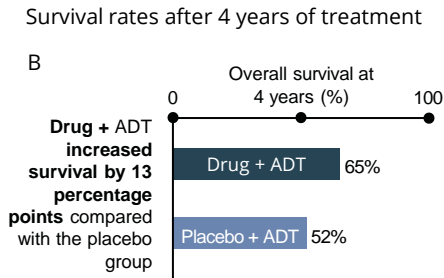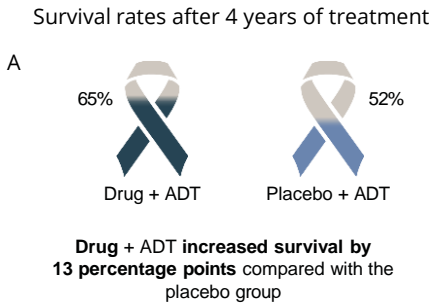
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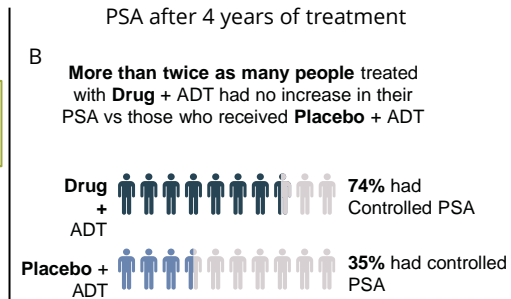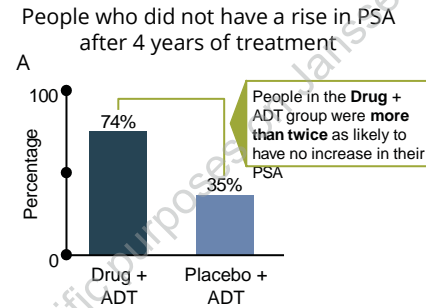
APPENDIX

Topics tested using 1 of 2 visuals (A and B) depicting the same data

Respondents evaluated 1 of 2 randomly assigned visuals, each depicting the same data from comparative effectiveness research for each of 4 topics. For efficacy and PSA data, the visuals showed superiority of treatment over placebo. Safety data visuals represented similar outcomes but did so positively or negatively. QoL visuals communicated parity between groups but did so without using numerical data
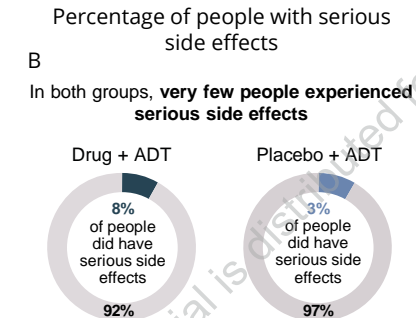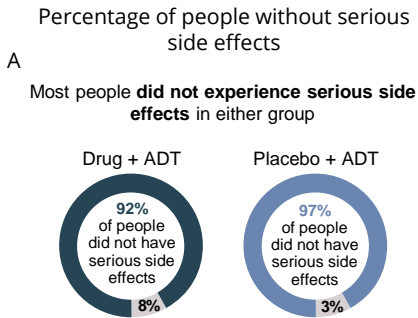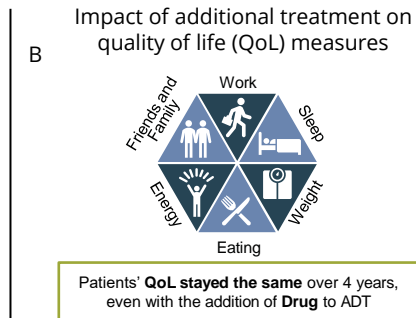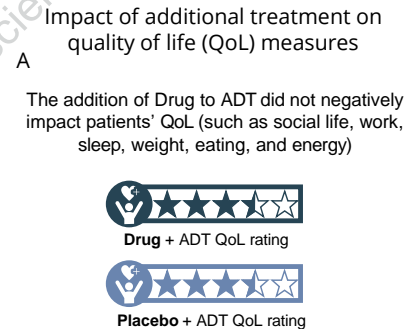

Efficacy

Survival rates after 4 years of treatment

A — Drug + ADT 65%; Placebo + ADT 52%

Drug + ADT increased survival by 13 percentage points compared with the placebo group

B — Overall survival at 4 years (%): Drug + ADT 65%; Placebo + ADT 52%

Drug + ADT increased survival by 13 percentage points compared with the placebo group

PSA

People who did not have a rise in PSA after 4 years of treatment

A — Drug + ADT 74%; Placebo + ADT 35%

People in the **Drug + ADT** group were **more than twice** as likely to have no increase in their PSA

PSA after 4 years of treatment

B — **More than twice as many people** treated with **Drug** + ADT had no increase in their PSA vs those who received **Placebo** + ADT

Drug + ADT: **74%** had Controlled PSA

Placebo + ADT: **35%** had controlled PSA

Safety

Percentage of people without serious side effects

A — Most people **did not experience serious side effects** in either group

Drug + ADT: **92%** of people did not have serious side effects (8%)

Placebo + ADT: **97%** of people did not have serious side effects (3%)

Percentage of people with serious side effects

B — In both groups, **very few people experienced serious side effects**

Drug + ADT: **8%** of people did have serious side effects (92%)

Placebo + ADT: **3%** of people did have serious side effects (97%)

Quality of Life (QoL)

Impact of additional treatment on quality of life (QoL) measures

A — The addition of Drug to ADT did not negatively impact patients' QoL (such as social life, work, sleep, weight, eating, and energy)

Drug + ADT QoL rating (4 stars)

Placebo + ADT QoL rating (4 stars)

Impact of additional treatment on quality of life (QoL) measures

B — Friends and Family, Work, Sleep, Energy, Eating, Weight

Patients' **QoL stayed the same** over 4 years, even with the addition of **Drug** to ADT

ADT, androgen deprivation therapy; PSA, prostate-specific antigen; QoL, quality of life

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Example of online survey questions based on a randomly assigned visual for each of 4 topics

For each randomly assigned visual, respondents were asked to (1) provide an unaided takeaway and (2) select the correct key takeaway from a multiple-choice list

Unaided Takeaway (respondents answered in their own words)

Respondent is shown randomly assigned visual, for example:

Survival rates after 4 years of treatment

65%

52%

Drug + ADT   Placebo + ADT
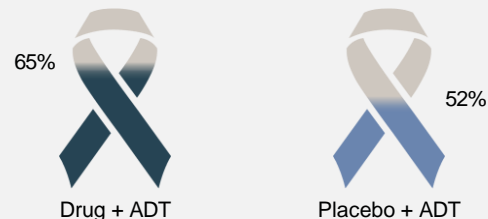
Drug + ADT **increased survival by 13 percentage points** compared with the placebo group

Respondent is then asked: *Imagine that you are discussing this graphic with your friend or family member. Based on this graphic, **what would you tell them about Drug + ADT**? What is your main takeaway?*

ADT, androgen deprivation therapy

Aided Takeaway (respondents chose from a multi-choice list)

Based on the same randomly assigned visual, respondent is then asked:

*Which one of the following statements about this graphic is **correct**?*

- More patients were alive after 4 years when taking Drug +ADT

- Patients lived longer when taking Placebo + ADT

- Survival rates over 4 years were NOT improved by Drug + ADT

- Drug + ADT decreased chance of survival after 4 years

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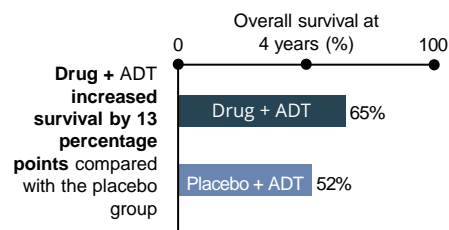Daniel E Spratt, Patrick J Bingham, John Eckardt, Shelby Moneer, Matthew J Pagano, Kirsten York
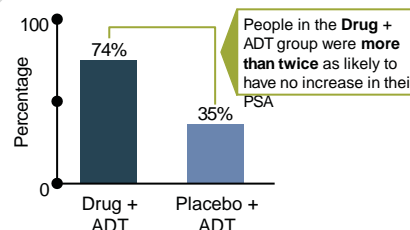
APPENDIX

Overall story

Online survey question about the overall story based on selecting the visual that better communicated the key takeaway for each of the 4 topics. Looking at all 4 of their chosen graphics together, respondents were asked to describe the overall story.

Examples of visuals from each of the 4 topics that respondents could have chosen:

Survival rates after 4 years of treatment

Overall survival at 4 years (%)

Drug + ADT **increased survival by 13 percentage points** compared with the placebo group

Drug + ADT 65%

Placebo + ADT 52%

People who did not have a rise in PSA after 4 years of treatment

74%

35%

People in the **Drug + ADT** group were **more than twice** as likely to have no increase in their PSA

Drug + ADT

Placebo + ADT

Percentage of people without serious side effects

Most people **did not experience serious side effects** in either group

Drug + ADT

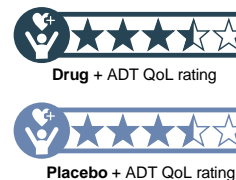**92%** of people did not have serious side effects

8%

Placebo + ADT

97% of people did not have serious side effects

3%
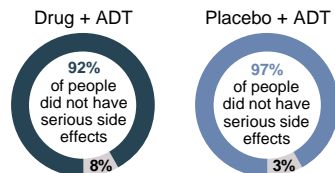
What is the overall story about Drug + ADT?

Impact of additional treatment on quality of life (QoL) measures

The addition of Drug to ADT did not negatively impact patients' QoL (such as social life, work, sleep, weight, eating, and energy)

★★★★☆

Drug + ADT QoL rating

★★★★☆

Placebo + ADT QoL rating

ADT, androgen deprivation therapy; PSA, prostate-specific antigen; QoL, quality of life

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