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RAPID COMMUNICATION

# From Optional to Default
## — Enhancing Article Viewership Through X (Formerly Twitter) Posting —

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***Background:*** The influence of a change to a default X summary posting strategy on article viewership has not been investigated.

***Methods and Results:*** We conducted a retrospective analysis of X-posting rates and journal viewership data for both the *Circulation Journal* and *Circulation Reports* from April 2022 to September 2023. Following protocol modifications in March 2023, there was a notable increase in the X-posting rate from 12.4% to 61.7%, along with an uptick in median access counts to article pages within 30 days, from 175 to 231.5.

***Conclusions:*** Trend analysis of journal viewership after a default X-posting strategy revealed an increase in viewer access.

**Key Words:** Article viewership; Default; X (formerly Twitter)

Social media, particularly X (formerly Twitter), is being increasingly utilized by medical journals to democratize access to scientific knowledge, facilitating a broader dissemination among authors and readers.[1] Although evidence suggests social media boosts journal metrics, including page views, Altmetric scores, and citations, the specific impact of isolated X posts remains underexplored. In Japan, studies indicate X summaries boost article viewership, yet the detailed effect of such individual posts is not fully understood.[2–5] Evidence from Japan also suggests that X summaries significantly boost viewership, despite a lack of randomized controlled trials.[6] Due to the platform's character limit, posting full articles on X is not feasible, necessitating separate X summaries. However, creating these summaries requires additional effort, resulting in a low submission rate of only 5–10%.

Boosting article viewership is crucial for journals, authors, and institutions, because it expands research dissemination. Relying solely on researchers' sporadic promotional efforts, however, is not a sustainable strategy for increasing visibility. To address this, The Japanese Circulation Society, managing the *Circulation Journal* (CJ)

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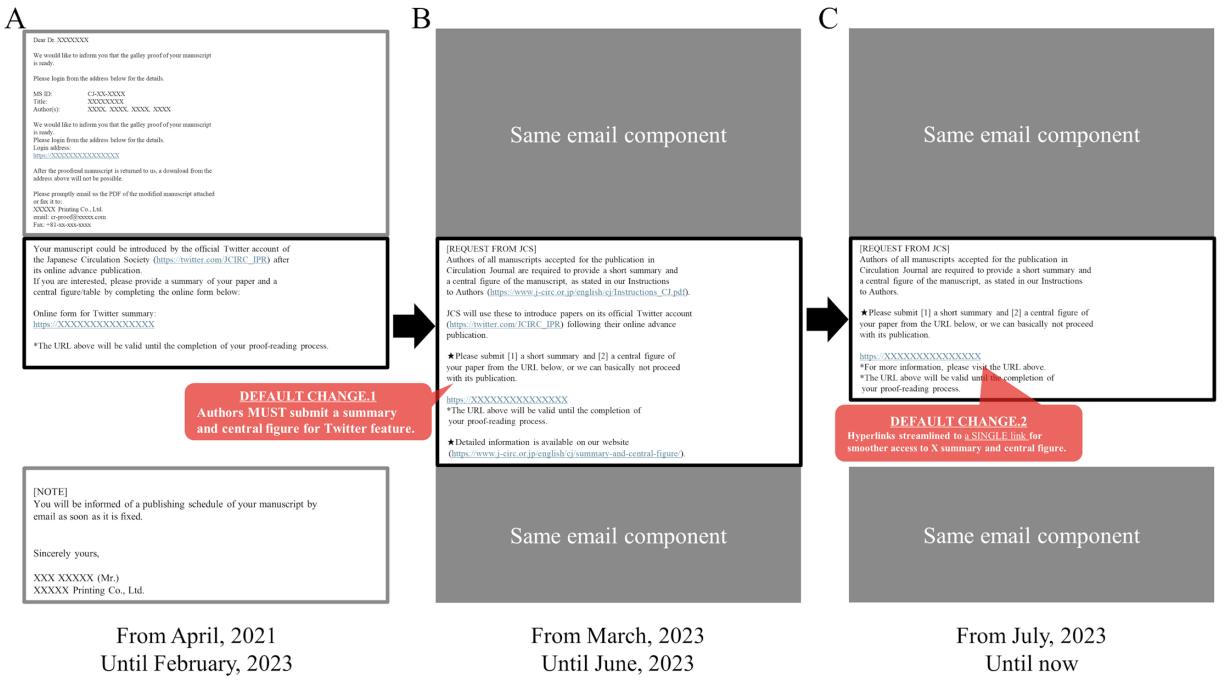


**Figure 1.** JCS X-summary collection system. (**A**) Email sent to authors regarding proofreading of the main manuscript and requesting an X summary (from April, 2021 until February, 2023). (**B**) Author's agreement for X summary usage reflecting DEFAULT 1: submission of a summary and central figure for X is mandatory for publication (from March, 2023 until June, 2023). (**C**) In DEFAULT 2, hyperlinks, except for the main link to summary posting pages, were streamlined to a SINGLE link for smoother submission of X summary and central figure.

and *Circulation Reports* (CR), has harnessed behavioral economics, implementing default settings and nudge theory to encourage more consistent engagement and yield long-term benefits such as higher citations. The Society mandated a default requirement for submitting an X summary and a central figure, aiming to increase submissions of X summaries and enhance article visibility. Recognizing the power of effective defaults, which suggest recommended actions, information highlighting the benefits of X summaries was included in proof emails. This study evaluates the impact of the integrated default X summary posting protocol changes on the submission rate of X summaries and the viewership of articles in both CJ and CR.

## Methods

We retrospectively analyzed the journal article viewership published from April 2022 to September 2023. We compared the X-posting rate and the journal article viewership between articles before (before March 2022) and after the X summary and central figure protocol. For this analysis, we merged the detailed X timing datasets and the journal article viewership data.

### Protocol Modifications Process on X-Posting Strategies in CJ and CR

1. The editorial board deliberated and approved operational changes.
2. Revised the Instructions to Authors for CJ (http://www.j-circ.or.jp/english/cj/Instructions_CJ.pdf) and CR (http://www.j-circ.or.jp/english/cr/Instructions_CR.pdf).
3. Created a dedicated page on the CJ/CR official websites to guide the submission of a Summary and Central Figure: CJ (https://www.j-circ.or.jp/english/cj/summary-and-central-figure/) and CR (https://www.j-circ.or.jp/english/cr/summary-and-central-figure/).
4. Send an email requesting the submission of an X-use Summary and Central Figure at the time of author proofs.
5. Mandatory Submission (DEFAULT 1): Requires all authors to submit an X-use Summary and Central Figure via the dedicated site to enhance research engagement and accessibility, aiming to reach a broader audience (**Figure 1B**).
6. Posts on X are made automatically on the early online publication date, including a direct hyperlink to an abstract page (ARTICLE page).
7. The start of requesting Summaries from all authors began with the late breaking clinical trial of the JCS in March 2023, and the submissions began appearing on X in April.
8. Streamlined hyperlinks (DEFAULT 2) and user experience enhancement (DEFAULT 3): Hyperlinks were consolidated into a single link for smoother access to the X summary and central figure. Implemented in July 2023, this improved accessibility and user engagement (**Figure 1C**). Submission platform design was modified to enhance user experience and simplify the process. An opt-out approach ensures authors understand the terms

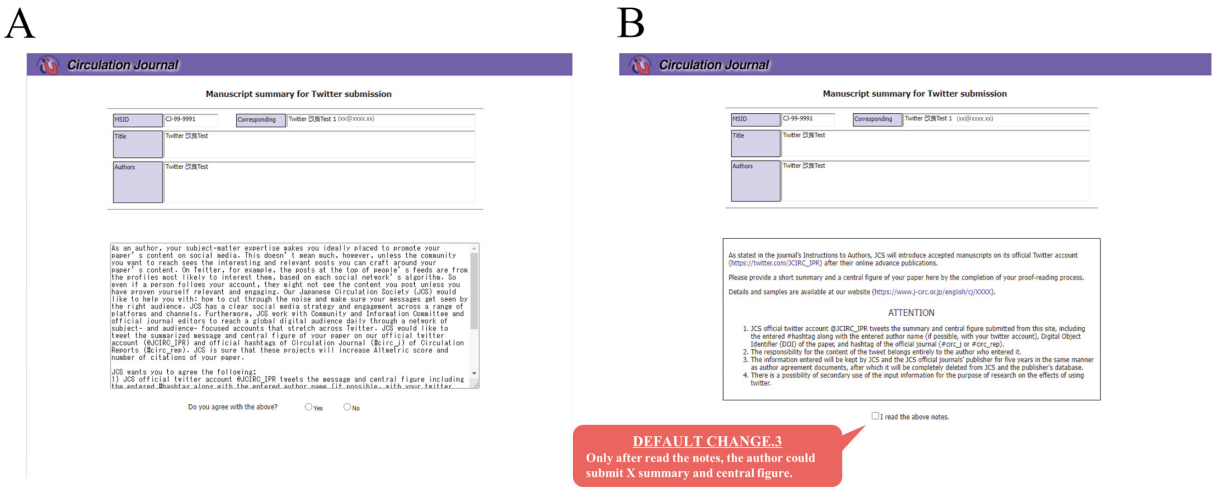


**Figure 2.** X summary input. (**A**) Original Summary posting screen now requiring consent. (**B**) DEFAULT 3: Submission of X summary and central figure is accepted after reading the notes, and confirmation is required.

for secondary use, promoting ethical sharing and transparency (**Figure 2B**).

9. X summary and central figure posted by JCS official account (followers >19,000) on the date of early publication.

## Data Collection

The Japan Science and Technology Information Aggregator, Electronic (J-STAGE) is a repository of academic journal articles and research papers created and maintained by the Japan Science and Technology Agency. We collected the journal viewership metrics of the 2 journals, including every access to the abstract pages (ARTICLE), HyperText Markup Language (HTML) pages, and Portable Document Format (PDF) documents downloaded with time stamps (date, hour, and minute) of each article on a monthly basis. We used these data from April 2022 to September 2023 for this analysis. The Altmetric scores were obtained through the application of the Altmetric.com API (https://api.altmetric.com) on December 31th, 2023.

## Statistical Analysis

Continuous variables are reported as median and interquartile range (IQR). Variables were compared using the Wilcoxon rank sum test. Categorical variables are reported as frequencies and percentages. We compared article category, X-posting rate, and article viewership metrics within 7 or 30 days of early publication (online advance publication). Temporal trends of X-posting rate and the average website access counts per article within 1, 3, 7, and 30 days were visually plotted on a monthly basis. To estimate the impact of the protocol modification, we made the following time series model for the average access counts aggregated biweekly with Fourier terms for seasonality:

$$meanACCESS_{k,t} = \beta_{k,0} + \beta_{k,1}\,t + \beta_{k,2}\,intervention_t + \beta_{k,3}\sin\left(\frac{2\pi t}{26}\right) + \beta_{k,4}\cos\left(\frac{2\pi t}{26}\right) + \beta_{k,5}\sin\left(\frac{4\pi t}{26}\right) + \beta_{k,6}\cos\left(\frac{4\pi t}{26}\right) + \varepsilon_{k,t},$$

where, $meanACCESS_{k,t}$ is the average access count at the time of $t$ within $k$ (=1, 3, 7 and 30) days on a biweekly basis, $\beta_k$s are regression parameters within $k$ days, $intervention_t$ is a dummy variable indicating after the protocol modification, and $\varepsilon_{k,t}$ represents the error term. All analyses were performed using the R version 4.2.2.

# Results

Among a total of 444 articles that were published as early publications from April 2022 to September 2023, 290 (65.3%) were categorized into the before group and 154 (34.7%) were categorized into the after group (**Table**). Journal and article categories were not different between before and after the protocol change. As shown in **Figure 3A** and the **Table**, the X-posting rate increased from 36 (12.4%) to 95 (61.7%). Of the 131 articles with an X posting, the average number of X postings per article was 2.2±0.9, with 1.6±0.5 in Japanese and 0.5±0.9 in English.

The access count to an ARTICLE page shortly after publication increased significantly across different time frames (**Figure 3B**, **Table**). Within the first day, the count rose from 29.00 [24.00, 40.00] to 51.50 [31.25, 73.75]. Within 3 days, it increased from 46.00 [35.25, 66.75] to 72.00 [49.00, 106.00]. Over 7 days, the count went up from 78.00 [56.25, 101.75] to 105.50 [76.25, 153.50]. And within 30 days, it escalated from 175.00 [134.00, 261.50] to 231.50 [155.50, 385.75]. The access count to the PDF page also increased, although the increase was more modest in comparison (**Table**). Furthermore, the access count to the HTML page remained unchanged before and after the protocol modification.

Time series models (**Figure 3C**,**D**) revealed the effects of the intervention. For articles, the estimated effect of the intervention within 1 day was 97.27 (95% confidence interval (CI): 16.62–177.92), while within 3 days it increased to 127.89 (95% CI: 13.85–241.92). Over a 7-day period, the estimated effect reached 140.76 (95% CI: −14.37–295.90), and within 30 days it was 103.82 (95% CI: −106.99–314.63). Similarly, for PDF documents, the estimated effects within

**Table. Comparison Between Before and After Protocol Modification**

| | Overall | Before | After | P value |
|---|---|---|---|---|
| N | 444 | 290 (65.3%) | 154 (34.7%) | |
| **Journal category, n (%)** | | | | |
| CJ | 314 (70.7) | 208 (71.7) | 106 (68.8) | 0.597 |
| CR | 130 (29.3) | 82 (28.3) | 48 (31.2) | |
| **Article category, n (%)** | | | | 0.095 |
| AR | 4 (0.9) | 4 (1.4) | 0 (0.0) | |
| BR | 1 (0.2) | 1 (0.3) | 0 (0.0) | |
| CL | 190 (42.8) | 123 (42.4) | 67 (43.5) | |
| CL-E | 45 (10.1) | 32 (11.0) | 13 (8.4) | |
| ED | 54 (12.2) | 38 (13.1) | 16 (10.4) | |
| ED-X | 1 (0.2) | 1 (0.3) | 0 (0.0) | |
| EX | 3 (0.7) | 2 (0.7) | 1 (0.6) | |
| EX-E | 3 (0.7) | 3 (1.0) | 0 (0.0) | |
| GL | 9 (2.0) | 5 (1.7) | 4 (2.6) | |
| GL-X | 2 (0.5) | 0 (0.0) | 2 (1.3) | |
| ICM | 97 (21.8) | 59 (20.3) | 38 (24.7) | |
| ICM-E | 1 (0.2) | 0 (0.0) | 1 (0.6) | |
| LE | 4 (0.9) | 4 (1.4) | 0 (0.0) | |
| ME | 7 (1.6) | 4 (1.4) | 3 (1.9) | |
| PP | 6 (1.4) | 4 (1.4) | 2 (1.3) | |
| RA | 2 (0.5) | 1 (0.3) | 1 (0.6) | |
| RA-N | 7 (1.6) | 7 (2.4) | 0 (0.0) | |
| RC | 8 (1.8) | 2 (0.7) | 6 (3.9) | |
| X posting rate, n (%) | 131 (29.5) | 36 (12.4) | 95 (61.7) | <0.001 |
| Altmetric score (median [IQR]) | 1.75 [1.00, 4.30] | 1.50 [0.50, 4.15] | 2.00 [1.00, 4.45] | 0.015 |
| **Access count (median [IQR])** | | | | |
| Within 1 days | | | | |
| PDF | 17.00 [13.00, 23.00] | 15.00 [12.00, 22.00] | 18.50 [15.00, 25.00] | <0.001 |
| ARTICLE | 33.00 [25.00, 56.00] | 29.00 [24.00, 40.00] | 51.50 [31.25, 73.75] | <0.001 |
| HTML | 4.00 [2.00, 5.00] | 4.00 [2.00, 5.00] | 4.00 [2.00, 6.00] | 0.294 |
| Within 3 days | | | | |
| PDF | 26.00 [19.00, 36.25] | 25.00 [18.00, 35.00] | 27.50 [21.00, 44.75] | 0.003 |
| ARTICLE | 53.00 [38.00, 76.25] | 46.00 [35.25, 66.75] | 72.00 [49.00, 106.00] | <0.001 |
| HTML | 5.00 [3.00, 7.00] | 5.00 [3.00, 7.00] | 5.00 [3.00, 8.00] | 0.215 |
| Within 7 days | | | | |
| PDF | 40.00 [29.00, 59.00] | 38.00 [28.00, 56.00] | 44.00 [31.00, 68.75] | 0.022 |
| ARTICLE | 85.50 [61.00, 122.00] | 78.00 [56.25, 101.75] | 105.50 [76.25, 153.50] | <0.001 |
| HTML | 7.00 [5.00, 11.00] | 7.00 [5.00, 11.00] | 7.00 [4.00, 12.00] | 0.634 |
| Within 30 days | | | | |
| PDF | 92.00 [63.00, 134.00] | 83.00 [60.25, 119.00] | 112.50 [72.75, 166.75] | <0.001 |
| ARTICLE | 187.00 [139.00, 303.75] | 175.00 [134.00, 261.50] | 231.50 [155.50, 385.75] | <0.001 |
| HTML | 20.00 [14.00, 30.00] | 19.00 [13.00, 27.00] | 24.00 [16.00, 34.00] | <0.001 |

AR, Authors Reply; CJ, *Circulation Journal*; CL, Clinical; CL-E, Clinical (Editorial); CR, *Circulation Reports*; ED, Editorial; EX, Experimental; EX-E, Experimental (Editorial); GL, Guideline; GL-X, Statement and others; ICM, Images in Cardiovascular Medicine; LE, Letter; ME, Message From the Editor-in-Chief; RA, Review; RA-N, Review (Not Invited); RC, Rapid Communication.

1, 3, 7, and 30 days were 31.90 (95% CI: −31.29–95.08), 48.84 (95% CI: −43.48–141.15), 60.39 (95% CI: −60.27–181.04), and 53.36 (95% CI: −116.94–223.66), respectively. Regarding HTML documents, the estimated effects within 1, 3, 7, and 30 days were 5.76 (95% CI: −1.60–13.11), 6.11 (95% CI: −5.67–17.89), −0.36 (95% CI: −31.84–31.13), and −4.33 (95% CI: −106.41–97.76), respectively.

## Discussion

This study evaluated the X summary posting rate and the time trend of article viewership after protocol modification for X summary posting. As anticipated, the implementation of default X postings, which highlight the summary and central figure of each article, not only increased the rate of X postings but also significantly boosted article viewership. This increase was particularly notable for direct hyperlinks to the ARTICLE page.

The default X-posting protocol boosted the posting rate by requiring a short summary and a central figure for publication, subtly enforced by the phrase "essentially cannot proceed without it." This method nudges authors into

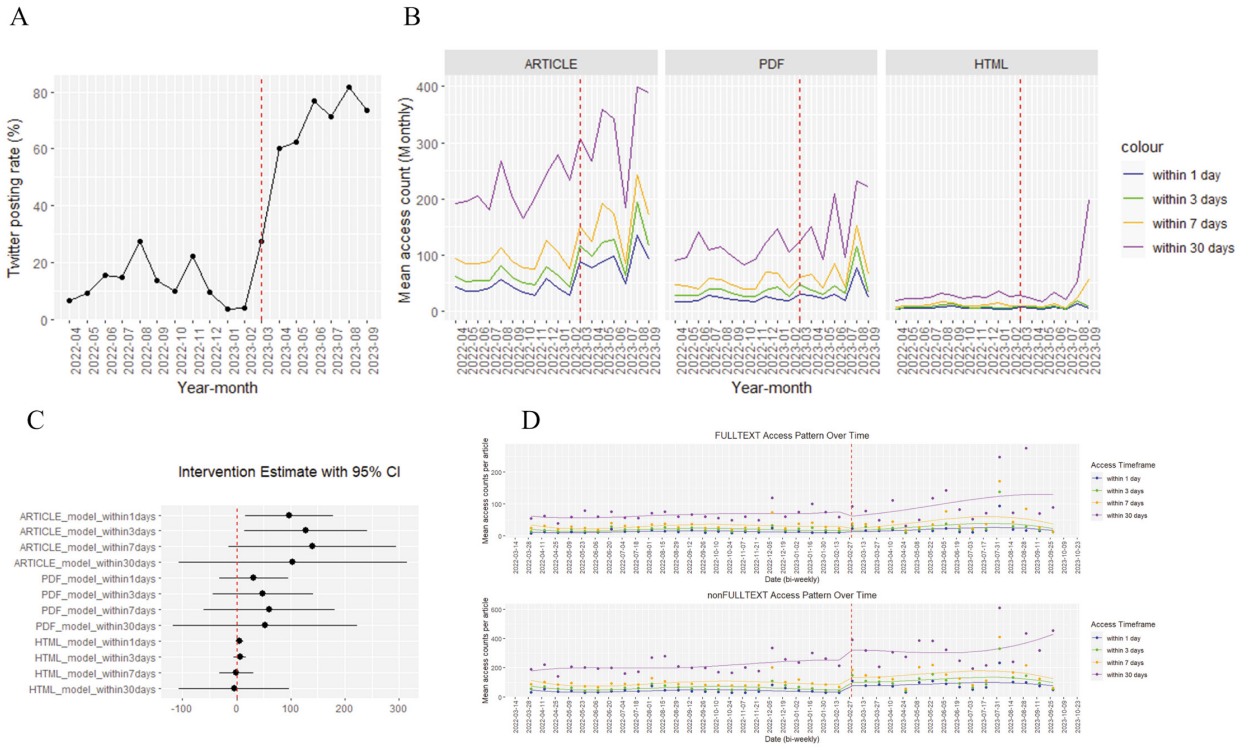


**Figure 3.** Analysis of access trends: (**A**) X (formerly Twitter) posting rate trends over time. The red dashed line indicates the date of the algorithm change on March 31, 2023. (**B**) Monthly variations in access counts for ARTICLE, PDF, and HTML pages. The plots show the mean access counts within 1, 3, 7, and 30 days from early publication. Each color represents a different access timeframe, with the red dashed line indicating the intervention date. (**C**) Forest plot representing the intervention estimate with 95% confidence intervals (CI) from the time series model. The plot includes estimates for ARTICLE, PDF, and HTML access counts within 1, 3, 7, and 30 days. (**D**) Time series changes in average access counts over 2-week periods. Access patterns for (**Top**) full-text content (PDF and HTML) and (**Bottom**) non-full-text content (ARTICLE). Points represent actual access counts, and lines depict predicted values from the model. The red dashed line indicates the intervention date.

compliance, ensuring summaries are included by making it a default requirement.[7] DEFAULT 2 simplified submission by reducing hyperlink options, mitigating choice overload and making it easier for authors to submit X summaries.[8] DEFAULT 3's implementation added a crucial consent layer to the protocol, necessitating authors to confirm their understanding of secondary use terms before submission.[9] Overall, these modifications adhere to the EAST (Easy, Attractive, Social, and Timely) framework, aiming to simplify actions for better outcomes.[10]

Our findings align with expectations that X postings significantly affect article viewership primarily on the first day, with a quick decline thereafter.[6] This was consistent across the initial 1, 3, 7, and 30 days post-protocol change, contrasting with earlier studies that suggested improved viewership weeks after X summary postings. This result points to the effectiveness of reusing X summaries and central figures. Future research should explore the benefits of content reposting for sustained viewership. Analysis also shows that viewership relates mainly to the abstract and ARTICLE page, indicating a default direction towards the ARTICLE page. Despite the equally easy access to both PDF and HTML formats and protocol changes, we only observed a modest increase in HTML views compared with PDFs. The results from open-access journals such as CJ and CR clearly show a preference for PDFs. Although suggesting that HTML is underutilized, these findings do not address of the use of other digital formats such as EPUB, which remains unexplored. Research on electronic publication formats, particularly on how formats such as EPUB affect the dissemination of scientific literature is scant and awaits further exploration.[11]

Our study, although indicating an increase in viewership post-protocol changes, has its limitations, chiefly its pre-post design, which did not fully account for concurrent trends or the rise in X followers that may have influenced outcomes. Additionally, X's algorithm change on March 31, 2023, is noted, but given the premodification posting rate of 12.4%, its effect is deemed minimal, though not entirely dismissible. The generalizability of our results may be limited to open-access journals, differing from subscription-based ones. The large number of followers on the X account used in this study also poses a limitation, making it difficult to generalize the results to journals with fewer followers. It is essential to validate our findings through randomized controlled trials (RCTs) in various journals across different fields. Also, about one-third of the X summaries were for image-based articles, which may inherently convey sufficient information, potentially affecting article viewership. Identifying the most effective X-posting strate-

gies for different article types remains an area for future study.

## Conclusions

Article viewership increased after a default X-posting protocol modification was implemented by the journals to simplify the process for all authors to utilize the social media platform.

### Highlights

- ✓ Default strategies increased summary collection rates for X (Twitter) posting.
- ✓ Article viewership also increased after protocol modification.
- ✓ The increased viewership is primarily attributed to the first 3 days after early publication.

### Acknowledgments

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### Disclosures

No conflicts of interest exist in this study, but we declare that our coauthors, Shoji Sanada, Masataka Sata, Koichi Node, and Toshihisa Anzai are members of the Editorial Team of *Circulation Report*.

### IRB Information

This study was exempted from ethics approval by the Ethics Committee of St. Luke's International Hospital (20-R118) because it was a retrospective observational study.

### Data Availability

The de-identified data of participants will not be shared.

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