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Article

# Vaping and Heart Failure: Did the News Get It Right? An Analysis of Scientific Content Translation Frequency from Abstract, Poster, and Press Release to News Coverage of the 2024 Medstar/American College of Cardiology Study of the All of Us NIH Database

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**Abstract: Background.** Cigarette smoking remains a leading cause of death and illness in the US and globally. Electronic cigarettes (ECs) were introduced as a potentially less harmful alternative and are now used by approximately 20 million American adults. How scientific studies on ECs are reported can significantly influence perceptions of adults who smoke who might consider alternative products. A 2024 non peer-reviewed study by Medstar Health researchers who analyzed data from the All of Us NIH database found a 19% increased risk of heart failure (HF) among ever-users of ECs. This finding was announced by the American College of Cardiology (ACC) in a press release, and was reported on by over 25 news organizations in the US and England. **Methods.** This analysis investigated the translation frequency of Medstar study-related data across four stages: the original database, the researchers' analysis, the press release issued, and subsequent news media coverage. Instances of material omissions, unsupported claims, and confirmation bias throughout the dissemination process were identified and discussed. **Results.** The analytic sample (n=1,073) represented coverage by general news sites (n=17) and science news sites (n=12) of material scientific content items (n=37) present in the abstract, poster and/or press release. News reports on average, republished 47-48% of the content items present in the press release. Specifically, general news sites included 66% of the author quotes and 42% of the data points from the press release (52% and 47% for science news sites, respectively). Strikingly, content present only in the study's abstract and/or poster, but absent from the press release, was omitted by all general news sites and largely ignored by science news sites (only 12% inclusion). Critical omissions included that exclusive EC use was not associated with a significant increase in HF, and the impact of combusted cigarette (CC) smoking in dual-users was discounted as having a minimal association with HF. These details were absent in the press release, as well as in almost all subsequent news reports. **Conclusion/Implications.** The accuracy and precision of news reporting on the Medstar study could have been substantially improved if the press release had been clearer about the contradictions and limitations of the study findings, and if news outlets had thoroughly examined and reported the complete study findings, including the abstract and underlying data, rather than primarily transmitting quotations from the press release. This points to areas for improvement in science reporting quality, which could benefit public health literacy.

**Keywords:** epidemiology; public health; e-cigarettes; smoking; news reporting; harm reduction

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## Overview

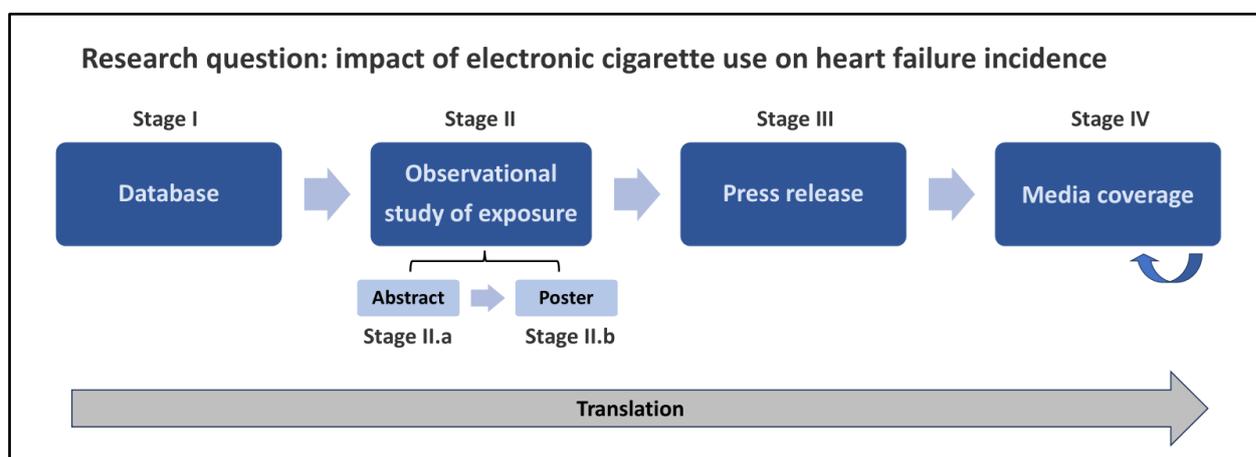
On April 29, 2024, CBS News aired a health segment that stated "vaping, just once, could put you at risk of heart failure" (Figure 1). The claim stemmed from a study conducted by researchers at

MedStar Health Baltimore and MedStar Georgetown University, presented as an abstract at the American College of Cardiology (ACC) 74th Annual Meeting.[1] At first glance, the headline was alarming—an urgent warning to a public already believing that EC were equally or more dangerous than CC.[2] But a closer look reveals a more complex story: the study didn't actually investigate the effects of vaping "just once." Furthermore, key findings were omitted from the CBS report and from the 22 other news organizations which covered this story. These omissions included that the EC ever-use cohort smoked CC more than they vaped, that smoking CC was modelled by the authors as having minimal impact—contrary to established research, and that vapers who didn't use EC showed no significant heart effects. Revealingly, Fox News was explicit about its confirmation bias, stating "let's be honest, it's great news, (because it provided an opportunity to highlight the harms of EC)".



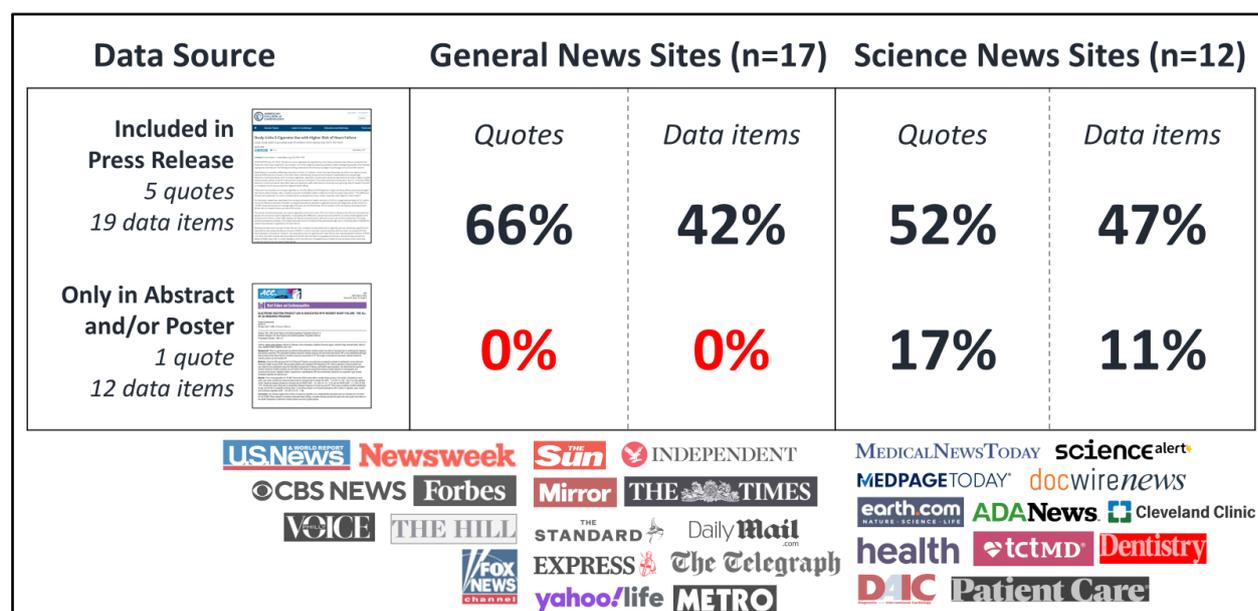
**Figure 1.** News report indicating that vaping just once can cause heart failure. Source: © CBS News, reproduced under Fair Use[3].

This case study examines how the MedStar study's findings were communicated across five stages of translation: the underlying database, the primary analysis by the study authors, the ACC press release, news media coverage, and commentary from AI chatbots (Figure 2). By tracing this chain, we can pinpoint where inaccuracies emerged and explore what fact-checking measures could have sharpened the precision and accuracy of the final reports. In particular, cases of selective omission, ungrounded assertions, and expression of confirmation bias will be investigated.



**Figure 2.** Four stages of dissemination of information from underlying database.

Figure 3 illustrates the primary findings of this case study. On average, approximately half of the content which was included in the ACC press release was re-communicated in each subsequent news story. In particular, general news sites communicated 66% of press release author quotations and 42% of non-quotation data items per news story. In contrast, material content which was not in the press release was completely omitted from all subsequent general news coverage and most science news coverage (0% and 12% inclusion frequency, respectively). The most salient omission, that vaping in never smokers was not associated with a significant increase in heart failure incidence, was mentioned in the initial abstract but then excluded in the poster and press release. Consequently, this result was omitted in 100% of the news reports of this study, with one newspaper asserting the opposite, that heart failure incidence was found to significantly increase even in EC users who didn't smoke.



**Figure 3. (Graphical Abstract).** Translation of content from primary study and press release to news sites. Logos are © of each news site and reproduced under Fair Use.

## Methods

The study by Bene-Alhasan et al., 2024 presented at ACC was selected as a case study, because of its ubiquity and reach in the US and UK 2024 news cycles regarding the health impact of electronic cigarettes, with coverage by at least 11 general news bureaus and 12 science news bureaus.[1] For the study itself, content which was generated in association with the ACC meeting was profiled; these included an abstract, poster presentation, and ACC-issued press release.[1,4] News stories were identified by searches on Google and Bing using keywords which included (“electronic cigarette” OR “e-cig\*” OR “vaping” OR “electronic nicotine”) OR [Bene-Alhasan OR Medstar]) AND “heart failure”), and combinations of subsets of these keywords, from a date of 4/1/2024 or later.

The press release was broken into contiguous sentences and phrases which represented the entirety of its content. Additional salient sentences and phrases which were present in the abstract and/or poster but not included in the press release were also identified. This matrix of news reports x content represented the analytic sample. Each news report was then scanned to capture the frequency of translation for each content element. In coverage of UK news sites, presentation of UK statistics on heart failure or tobacco use were counted as mirroring similar disclosures of US statistics in the Medstar / ACC content. A mention of the UK NHS supporting EC use for stopping smoking was not counted as evidence of mirroring the Medstar poster if the mention came in a section of the news report which was not discussing the Medstar study.

The lead author of the Medstar study was contacted four times with questions about the study over the course of a year, but did not respond. Therefore, this analysis will be initially published on a public preprint server to provide an additional opportunity for timely correction or commentary by the Medstar authors or the news outlets that reported on this study.

### **Stage I: The All Of Us Database was the Source of the Underlying Data**

The underlying data analyzed by the Medstar team originated in the All of Us Research Program.[5] All of Us is a national multi-year database initiated in 2016, administered under the auspices of the National Institutes of Health (NIH). Participants are surveyed with questionnaires on demographics, lifestyle practices and health conditions, and for some participants, data can include electronic health records, blood samples, and digital health tracking.

#### ***The All of Us database measures CC use history comprehensively and precisely***

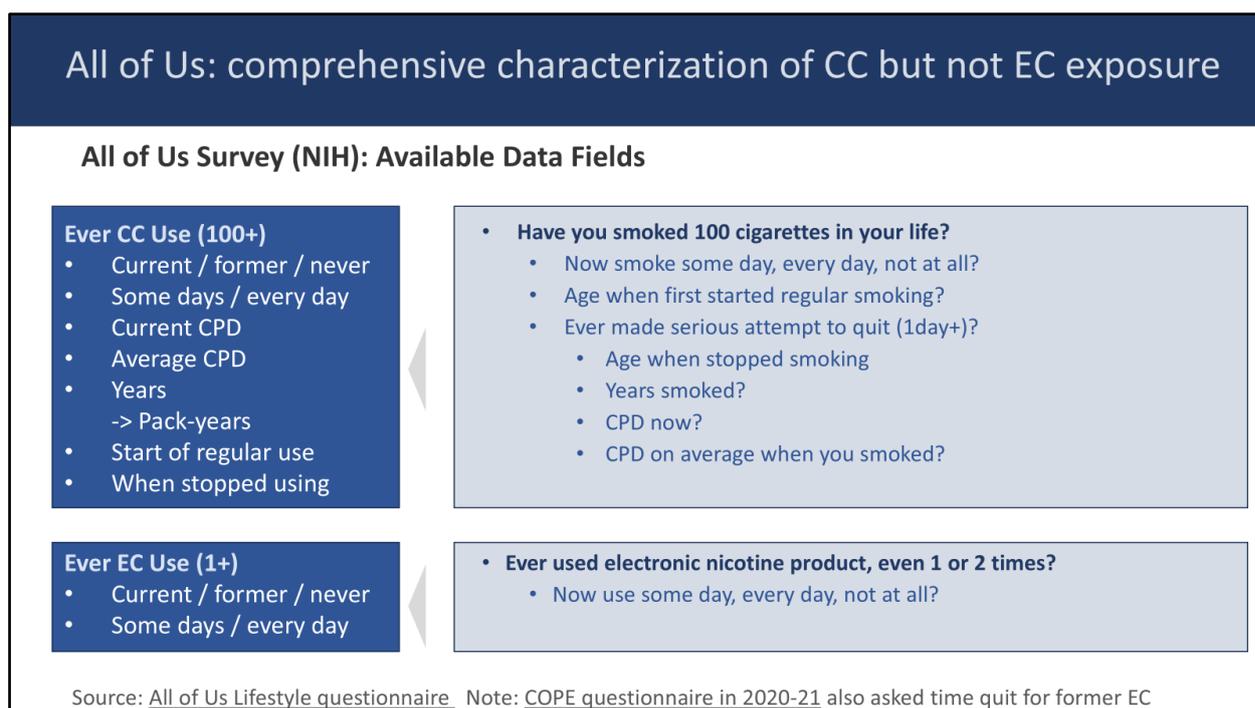
The use of combusted cigarettes (CC) has been causally linked to subsequent cardiovascular disease. It has been shown that quantifying duration, timing and intensity of use are each important for precision and accuracy of assessment of risk associated with cigarette use; tobacco use-associated risk increases over years and decades as duration of use increases, and decreases over years after quitting.[6]

The All of Us Lifestyle Questionnaire contains a sufficient dataset to precisely characterize exposure and associated cardiovascular risk for CC, but less precisely for EC (see Figure 4).[5]

At a minimum, pack-years of CC exposure are necessary for precision of the dose-response relationship between exposure and risk. For CC use, beyond generalized use status (current- former- and never-use) a comprehensive set of metrics are assessed by All of Us, including, both current intensity of smoking as well as cumulative pack-year related data, and time started and stopped, for former smoking. As is typical for most studies, lifetime CC smoking of less than 100 times is classified as “never use.”

#### ***The All of Us database measures EC use history incompletely and imprecisely***

In contrast to CC use, EC use is characterized in the All of Us database with a limited set of metrics indicative of current use status but not duration of use. Subjects are classified based on current- former- or never-use. Current use is further sub-segmented into some-day and every-day use. Unlike CC use, duration of use or number of uses is not collected. In this respect, the All of Us study deviates from the PATH study, which does collect this more comprehensive information. The PATH study dataset, for instance, demonstrates that most adult ever-EC users and most current some-day users in their database had lifetime usage of fewer than 100 times (i.e. they would be classified as “never users” if assessed similarly to CC use).[6]



**Figure 4.** Data fields pertaining to EC and CC use, All of Us Study. Data fields from the All of Us Lifestyle Questionnaire. Abbreviations: CC (cigarettes), EC (electronic cigarettes), CPD (cigarettes per day; 20 cigarettes = 1 pack).

**Stage II: The Medstar team studied a population of EC ever-users who smoked more than they vaped and found inconsistent results**

The Medstar Health authors analyzed data from the All of Us database to assess the impact of EC exposure on heart failure (HF) risk. 175,667 participants were identified who had EC and CC usage data available, as well as subsequent medical electronic health records (EHR) tracking an average of 45 months. Participants with prior HF were excluded, and 3,242 subsequent HF events were reported in the EHR during the prospective health record period.

***The Medstar authors incompletely characterized both CC and EC exposure***

To characterize EC exposure, the authors tracked current usage status at a single time point (EC current-use, former-use, and never-use at the beginning of the prospective period; current-use was subsegmented into every-day and some-day use). Duration of use or number of uses were not available in the All of Us data set and so were not tracked. To characterize CC exposure, the authors tracked current usage status at a single time point (CC current-use, former-use, and never-use.) Even though pack-year exposure and time quit data were available in the All of Us database, they were not utilized in the analysis. Lastly, CC and EC use were not tracked during the 45 month prospective period. In summary, duration of use was not tracked for CC as well as EC usage, therefore exposure quantification was incomplete and imprecise.[6]

### Medstar study used incomplete and imprecise exposure metrics

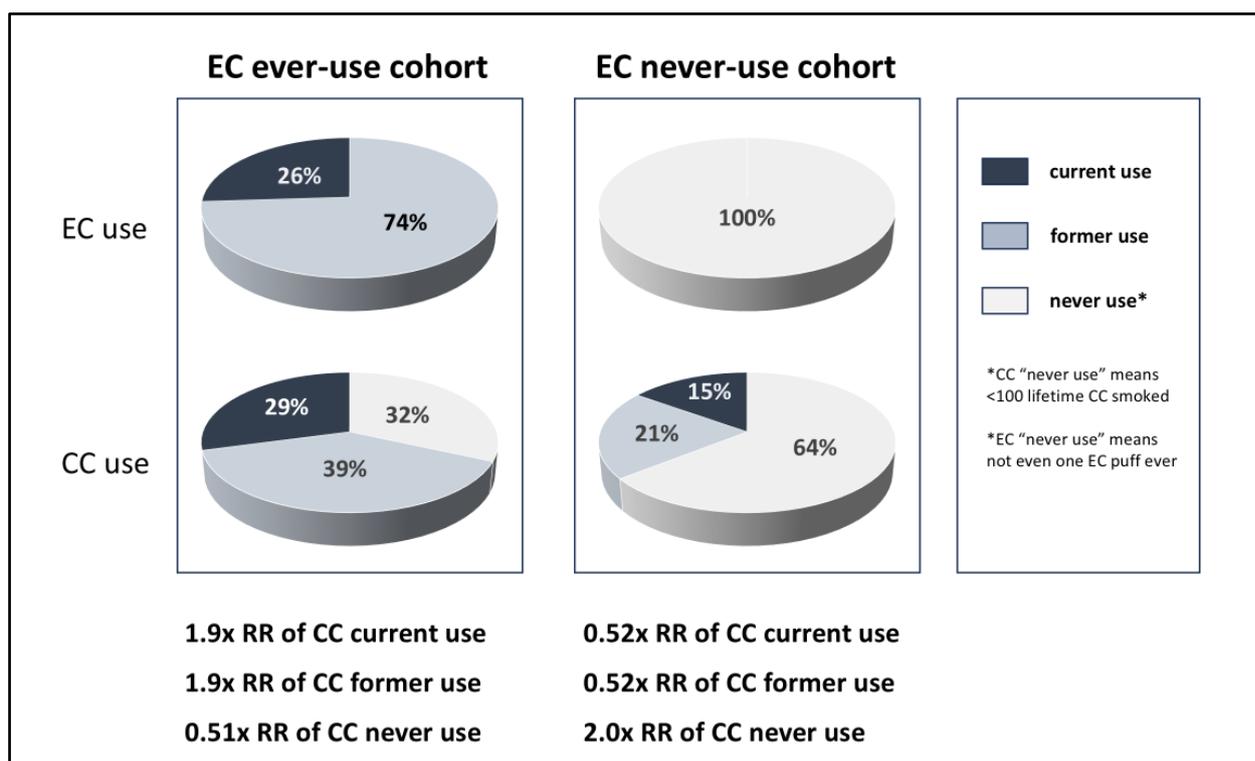
CC exposure metrics			EC exposure metrics		
CC Ever-Use (Definition: 100+ uses)	All of Us Database	Bene-Alhasan et al.	EC Ever-Use (Definition: 1+ uses)	All of Us Database	Bene-Alhasan et al.
Current / former / never	✓	✓	Current / former / never	✓	✓
Every day / some days	✓	✗	Every day / some days	✓	✓
Current CPD	✓	✗			
Average CPD	✓	✗			
Years of use	✓	✗	Years of use	✗	✗
(Derived) Pack-years	✓	✗	Lifetime number of uses	✗	✗
Start of regular use	✓	✗	Start of regular use	✗	✗
When stopped using	✓	✗	When stopped using*	✓*	✗

Source: All of Us Lifestyle questionnaire. \*Note: COPE questionnaire in 2020-21 also asked time quit for former EC

**Figure 5.** The Medstar study utilized incomplete and imprecise EC and CC exposure metrics in their study of the impact of EC exposure. Left panel: CC use metrics. Right panel: EC use metrics. Abbreviations: CC (conventional cigarettes), EC (e-cigarettes), CPD (cigarettes per day).

*In the EC ever-use cohort, current smoking exceeded current vaping, and CC use was 1.9X higher than in the EC never-use cohort.*

The All Of Us sample assessed by the Medstar authors were segmented into EC ever-users (n= 28,660, mean age 40) and EC never-users (n= 147,007, mean age 54). In the EC ever-use group, prevalence of current smoking exceeded the prevalence of vaping (29% were CC current users vs. 26% current EC use). Furthermore, the CC smoking rate was 1.9x twice as high in the EC ever-use group vs. in the EC never use group (see Figure 3). Therefore, it was critical for the authors to disambiguate between the impact of smoking CC vs. vaping EC in these cohorts.



**Figure 6.** EC and CC use histories, Medstar study. EC and CC use status at the start of the prospective period, EC ever-use cohort (left column) EC never-use cohort (middle column). Abbreviations: RR (relative risk), EC (electronic cigarette), CC (conventional combusted cigarette).

***In the raw data, EC users had 34% lower incidence of HF than non-EC users***

As shown in Table 1, the ~29k EC ever-users had 361 HF diagnoses, vs. 2,881 HF diagnoses for ~147k EC never-users, meaning that in the raw data the EC ever-use group had OR of 0.64 for HF relative to the EC never-use group.

***In contrast to EC use, CC use was reported by the authors to contribute almost no HF risk, which is inconsistent with the literature***

Non-randomized observational studies by definition compare groups which are unbalanced, therefore odds ratios (OR) should be adjusted to balance out background differences in risk.[6] The authors adjusted the relative risk of HF in the EC ever-use group vs. EC never-use group, from an unadjusted risk of 0.64, to an adjusted risk (aOR) of 1.19, in 3 sequential adjustment steps.

First, demographic factors were adjusted for, followed by smoking and substance use, and lastly by cardiovascular risk factors like diabetes and hypertension. When the authors adjusted for sociodemographic factors, such as a 14 year difference in ages between the EC use and non-use groups, the 0.64 OR was adjusted in a first model to aOR 1.19.

When a further adjustment for CC use was made (Model 2, see especially content highlighted in red), the aOR in a second, expanded, model was similar (1.17). In other words, the modeling approach which the authors used found that the almost doubling of prevalence of current and former CC use in the EC ever-use group only caused a 2% increase in HF risk. This result is highly inconsistent with the literature, which shows that CC use can cause a doubling or greater of cardiovascular risk.[7,8]

Lastly, the EC ever-use group had lower rates of diabetes, hypertension, and hypercholesterolemia vs. the EC never-use group, therefore their HF adjusted odds ratio was increased to a final result of 1.19 to account for that imbalance between groups in their Model 3, which was the main (reported) model.

**Table 1.** Characteristics of EC ever- and never-use groups, (Bene-Alhasan et al., 2024). OR (odds ratio), aOR (adjusted odds ratio), HF (heart failure).

	EC Ever-Users	EC Never-Users	HF aOR  ( <i>EC Ever-Users</i> vs. <i>EC Never-Users</i> )
Total sample	n=28,660 Age 40 (+/- 14)	n=147,007 Age 54 (+/- 16)	
<b>HF Incident cases</b>	<b>361 (1.26%)</b>	<b>2,881 (1.96%)</b>	<b>Risk of HF (unadjusted) OR = 0.64</b>
Odds ratio adjustments in the model - adjustments applied sequentially in 3 steps			
Model 1	<i>Adjustments for age and demographic factors doubled the relative risk of HF associated with EC use in the model</i>		<b>Risk of HF (adjusted) 0.64 -&gt; 1.19 aOR of HF</b>
Model 2 “accounted for the impact of CC smoking and substance use”	<b><i>Adjustments for tobacco and substance use reduced the EC group risk by only 2% (from 1.19 to 1.17) even though the EC group smoked CC almost twice as much as the EC non-use group</i></b>		1.19 -> 1.17 aOR of HF
Model 3 (main model includes all 3 adjustments)	<i>Adjustments for diabetes, hypertension, hypercholesterolemia</i>		1.17 -> 1.19 aOR of HF <b>aOR = 1.19 [1.04-1.34]</b>

In summary, to account for imbalances, the OR were multiplied by adjustment factors which aggregated to a 190% adjustment to aOR 1.19, with a confidence interval of [1.04-1.34]. In other words, the authors asserted that their analysis of the impact of EC exposure was precise enough that its error was less than +/- 12.6%. This level of accuracy was asserted even though the characterization of CC and EC use was extremely incomplete and imprecise (pack-years of CC use were not reported, and duration of EC use was not tracked by the database). Based on comparable PATH study data, the current CC users likely had decades of CC use pack-years, while most of the vaping in the ever-use group was likely less than 100 lifetime uses.[6]

*The authors found no evidence for a dose-response association of EC use with HF and no effect in EC users who didn't smoke CC*

In the abstract, the authors mentioned that of the EC ever-users who didn't smoke, there was no significant association with HF (aOR = 1.04 [0.57-1.89]).[4] Furthermore, the authors reported that there was no difference seen between current every-day and some-day EC users (this was in contrast to an abstract published the previous year by these authors in which they reported an association of cannabis use with a 34% increase in HF incidence that was dependent on frequency of use.[9] The authors did report that EC users who were also dual-users of CC had a 59% increase in HF incidence. [ref: medpage today]. These results suggest that all of the risk in the EC ever-use group may have been due to current CC smoking.

*The authors reported a difference between two types of heart failure*

The abstract and presentation indicated a difference in aOR for two types of heart failure, HFpEF (aOR 1.21 [1.01 - 1.47]) and HFrfEF (aOR 1.11 [0.90-1.37]). The press release did not provide odds ratios, but highlighted that an association between EC use and HF was seen in one category of HF but not the other.

**Stage III: The American College of Cardiology issued a press release days before the study was presented, which omitted key findings from the abstract and poster.**

As shown in Table 2, an ACC press release was released in concert with a separate publication of the Medstar abstract on 4/2/24. A Medstar poster was presented five days after the press release, on 4/7/24.

**Table 2.** Data releases by Medstar authors and the American College of Cardiology.

Medstar / ACC data releases	Date	Comment
<a href="#">Abstract</a>	4/2/24	Abstract published in Journal of ACC
<a href="#">Poster presentation</a>	4/7/24	The 4/7 poster time of presentation was mentioned in the 4/2 press release; actual poster was released behind paywall or available from authors
<a href="#">Press release</a>	4/2/24	Press release by ACC

*The press release consisted of 24 key facts and quotations*

As shown in Table 3 below, the press release, when segmented into contiguous sentences and phrases, contained 19 data points and 5 quotations summarizing the interpretation of the study authors. The abstract and poster contained at least 11 additional salient data points and one quotation.

*Central information was omitted, modified, or obscured in the press release*

The most salient points present omitted in the press release (but present in the abstract and/or poster presentation) included the following:

- The EC ever-use group smoked CC more than it vaped EC (29% vs. 26% current use at the start of the 45 month prospective period)
- The EC ever-use group smoked CC at 1.9x the rate of the EC never-use group

- The impact of the 1.9x difference in CC use in the EC group was only a 2% increase in HF risk in the fully adjusted model
- EC exclusive users (never smokers) had 4% increased risk, which was not significant
  - This was in the abstract but omitted from the poster and press release
  - The poster instead mentioned that dual-users had 59% increased risk
- There was no difference between EC current users who were every-day and some-day users (no dose response)

The only quotation from the authors in the poster was changed in the press release:

- Poster: *“Electronic nicotine product use should be discouraged among the youths (sic) while further studies are conducted”*
- Press release: *“EC use is not recommended for quitting smoking”*

The press release also obscured the fact that CC smoking was modeled as being almost completely safe:

- Abstract, poster and press release: *“there was no evidence that age, sex or smoking status modified the relationship between EC and HF.”*
- Poster: the adjustment for a 1.9X difference in CC use prevalence was modeled as an impact of 2% change in HF risk.

The press release selectively highlighted a difference in aOR between two types of HF, but did not mention the difference between EC users who were CC never-users vs. ever-users.

- Press release: the association between EC use and HF was significant for HFpEF but not for HFrfEF. (Poster and abstract: HFpEF aOR 1.21, HFrfEF aOR 1.11)
- Press release: the association between EC use and HF was significant (aOR 1.19)
- Abstract: the association between EC use and HF was not significant in never smokers (aOR 1.04).

**Stage IV: The Medstar study was reported on by at least 17 general news sites and 12 science news sites. General news sites and most science news sites did not communicate salient data which was not in the press release.**

**Table 2.** News sites which reported on the Medstar study included 17 general news sites and 12 science news sites.

General news sites	Date	Science news sites	Date
<a href="#">Forbes</a> [10]	4/2/24	<a href="#">DAIC</a> [11]	4/2/24
<a href="#">The Hill</a> [12]	4/2/24	<a href="#">Patient Care</a> [13]	4/2/24
<a href="#">US News World Rep</a> [14]	4/2/24	<a href="#">Earth.com</a> [15]	4/2/24
<a href="#">Philly Voice</a> [16]	4/2/24	<a href="#">MedPage Today</a> [17]	4/2/24-3/24
<a href="#">Daily Mail</a> (UK) [18]	4/2/24	<a href="#">Dentistry</a> (UK) [19]	4/4/24
<a href="#">Yahoo Life!</a> (UK) [20]	4/2/24	<a href="#">Health</a> [21]	4/11/24
<a href="#">Metro</a> (UK) [22]	4/2/24	<a href="#">TCTMD</a> [23]	4/12/24
<a href="#">The Sun</a> (UK) [24]	4/2/24	<a href="#">Science Alert</a> [23]	4/15/24

<a href="#">Telegraph</a> (UK) [25]	4/2/24	<a href="#">Medical News Today</a> [23]	4/27/24
<a href="#">Newsweek</a> [26]	4/3/24	<a href="#">DocWire News</a> [27]	7/24/24
<a href="#">The Independent</a> (UK) [28]	4/3/24	<a href="#">Cleveland Clinic</a> [29]	11/20/24
<a href="#">The Times</a> (UK) [30]	4/3/24	<a href="#">ADA News</a> [31]	Not disclosed
<a href="#">Daily Express</a> (UK) [32]	4/3/24		
<a href="#">Mirror</a> (UK) [33]	4/3/24		
<a href="#">Standard</a> (UK) [34]	4/3/24		
<a href="#">Fox News</a> [35]	4/7/24		
<a href="#">CBS News</a> [3]	4/29/24		

**82% of general news site reports were published within one day of the press release and before the poster data was presented**

Of the 17 general news site reports, 88% published in advance of the poster presentation, on the day the press release was published (9 reports), or the day after (6 reports). In contrast, approximately half of the science news site articles published after the poster was presented and not on the day the press release was published.

**Salient data and quotations which were not in the press release were omitted in all general news reports and most science news reports**

On average, 47-48% of the content which was included in the ACC press release was re-communicated in each subsequent news story, (see Table 3 and Figure 2). In particular, general news sites communicated 66% of press release author quotations and 42% of non-quotation data items per news story.

In contrast to content which was in the press release, 0% of the content which was only available in the underlying abstract and/or poster was communicated by general news sites, while 12% of this content was included by science news sites. In other words, data which was not in the press release was completely omitted from all subsequent general news coverage and most science news coverage. The most salient finding, which was that vaping in never smokers was not associated with a significant increase in heart failure incidence, was mentioned in the initial abstract but then omitted by the authors in the poster and press release, and subsequently was omitted in 100% of the 29 news reports of this study.

**Table 3.** Translation frequency of content items present in the abstract, poster and press release to general news and science news reports. Abstr. (abstract), Press Rel. (press release), News Rpt. (general news site report), Sci. Rpt. (science news site report). \*UK or international prevalence statistics reported in UK papers. \*\*A mention of the UK NHS supporting EC use for stopping smoking was sometimes also cited in UK papers, in segments following the discussion of the Medstar study.

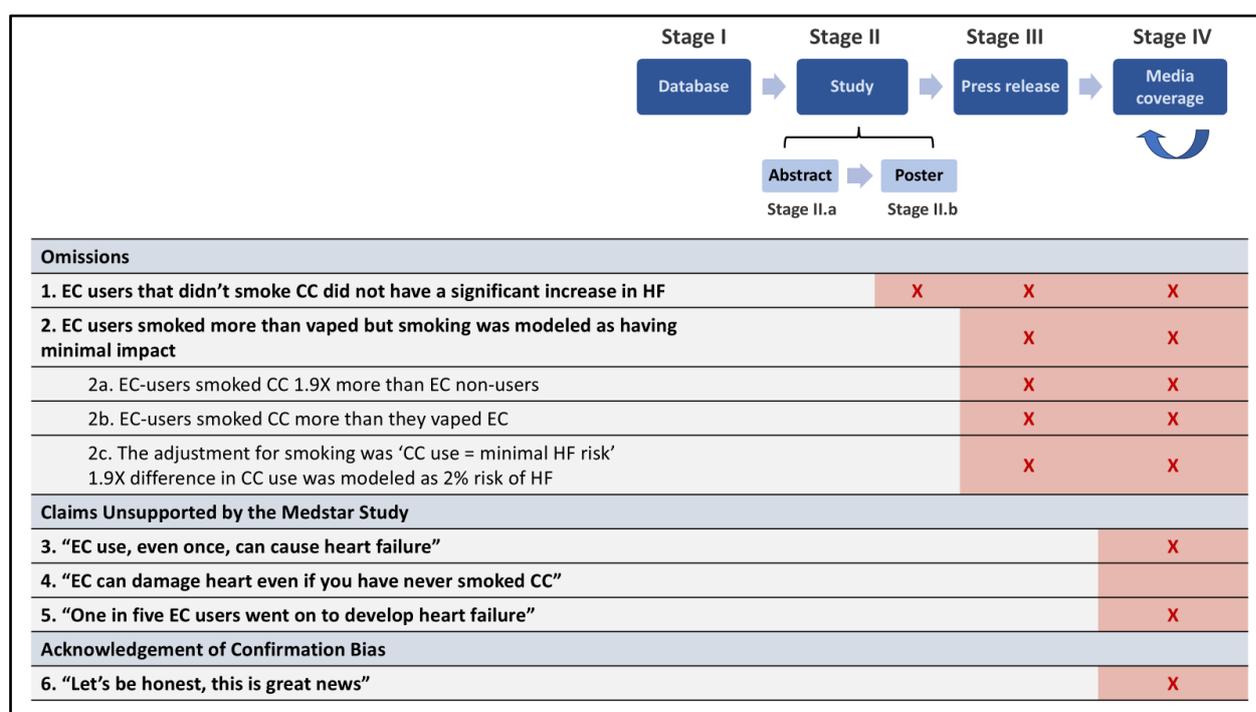
Inclusion in Abstract, Poster, Press Release			Translation Frequency		Content item (data points and quotations)
					<ul style="list-style-type: none"> <li>Items in press release (n=24; 5 quotes, 19 data points)</li> <li>Items not in press release (n=13; 1 quote, 12 data points)</li> </ul>
Abstr.	Poster	Press Rel.	News Rpt. n=17	Sci. Rpt. n=12	<ul style="list-style-type: none"> <li><b>Bold:</b> median content included in general news reports (&gt;50% translation frequency)</li> <li><b>Grey highlight:</b> direct or indirect quotes from study authors providing qualitative interpretation</li> </ul>
✓	✓	✓	94%	100%	<b>The results showed that people who used e-cigarettes at any point were 19% more likely to develop heart failure compared with people who had never used e-cigarettes.</b>

X	X	✓	94%	83%	“More and more studies are linking e-cigarettes to harmful effects and finding that it might not be as safe as previously thought,” said Yakubu Bene-Alhasan, MD, a resident physician at MedStar Health in Baltimore and the study’s lead author.
✓	✓	✓	88%	92%	175,667 study participants (an average age of 52 years and 60.5% female).
✓	✓	✓	88%	75%	Presented at the ACC annual scientific session
✓	✓	✓	82%	75%	Of this sample, 3,242 participants developed heart failure within a median follow-up time of 45 months.
X	X	✓	76%	75%	“The difference we saw was substantial. It’s worth considering the consequences to your health, especially with regard to heart health.”
X	X	✓	71%	58%	“I think this research is long overdue, especially considering how much e-cigarettes have gained traction,” Bene-Alhasan said. “We don’t want to wait too long to find out eventually that it might be harmful, and by that time a lot of harm might already have been done. With more research, we will get to uncover a lot more about the potential health consequences and improve the information out to the public.”
✓	✓	✓	65%	83%	Breaking the data down by type of heart failure, the increased risk associated with e-cigarette use was statistically significant for heart failure with preserved ejection fraction (HFpEF)—in which the heart muscle becomes stiff and does not properly fill with blood between contractions.
X	X	✓	65%	25%	Heart failure affects 6M US adults, heart too stiff or weak*
X	X	✓	47%	8%	Researchers said the new study findings point to a need for additional investigations of the potential impacts of vaping on heart health, especially considering the prevalence of e-cigarette use among younger people.
✓	✓	✓	41%	42%	EC impact on HFpEF was not significant
X	X	✓	41%	33%	"EC not recommended for quitting smoking"***
✓	✓	✓	41%	33%	<i>People who use e-cigarettes are significantly / substantially more likely to develop heart failure compared with those who have never used them</i>
X	X	✓	35%	17%	Rates of HFpEF have risen in recent decades
X	X	✓	29%	58%	Observational data is not conclusive for a causal effect
✓	✓	✓	29%	50%	Study used All of Us database from NIH
✓	X	✓	29%	25%	EC have been portrayed as safer but growing research lead to increased concern
✓	✓	✓	24%	42%	Accounted for demographic, socioeconomic, heart disease factors
X	X	✓	24%	42%	One of the most comprehensive / largest studies to date
X	X	✓	18%	25%	Align with previous studies in animals and humans
X	X	✓	18%	25%	Previous studies had limitations including smaller sizes
✓	✓	✓	12%	58%	No evidence that age, sex or smoking status modified the relationship between EC and HF
X	X	✓	12%	8%	5-10% of teens and adults use EC. Surgeon General called youth EC use an epidemic*
✓	X	✓	6%	25%	Electronic nicotine products include e-cigarettes, and deliver nicotine in aerosol form without combustion.
✓	✓	X	0%	25%	HFpEF aOR 1.21, HFReEF aOR 1.11
X	✓	X	0%	25%	Dual users had 59% increased risk of incident HF
✓	✓	X	0%	17%	Exclusion: Patients with baseline HF Dx.
✓	X	X	0%	17%	PATH--styled questions on EC use.
X	✓	X	0%	17%	"Electronic nicotine product use should be discouraged among the youth while further studies are conducted"*
X	✓	X	0%	8%	Inclusion: Adults 18+

X	✓	X	0%	8%	70% were White, 20% were Black, and 10% were Asian or Hispanic
X	✓	X	0%	8%	EC never-use group: current CC use 15%
✓	✓	X	0%	8%	EC ever-use: aOR for HF 1.19, 95% CI [1.06 -1.35] in the fully adjusted model factoring in all covariates.
✓	X	X	0%	8%	No difference between EC current users who were every-day and some-day users (no dose-response)
X	✓	X	0%	0%	EC ever-user group: current EC use 27%, current CC use 29%
X	✓	X	0%	0%	Impact of 1.9x difference in CC use in the EC group was only 2% increase in HF risk in the fully adjusted model
✓	X	X	0%	0%	EC exclusive users (never smokers) had 4% increased risk, which was not significant .

### *News site reporting included material omissions, unsupported claims, and acknowledgement of confirmation bias*

As shown in Figure 7, omissions, unsupported claims, and acknowledgement of confirmation bias had multiple points of origination across the stages of information dissemination.



**Figure 7.** Instances of material omissions, unsupported claims, and acknowledgment of confirmation bias.

*Material omissions centered on the HF impact of CC vs. EC use and appear to have originated from the study authors and/or ACC, as well as from News Media not reporting on the abstract content*

1. **Non-smoking EC users did not have a significant increase in heart failure incidence.** As previously discussed, the press release and poster omitted this item which was only included in the abstract. Subsequently, no news report included this finding.
2. **CC use was 1.9x higher in the EC use group, but CC use was surprisingly reported as having a minimal association with HF risk, calling the entire study into question.** This data was omitted from the press release and most subsequent news reports.

- a. Medpage Today was the only site which reported that the EC group smoked CC 1.9X more than the non-EC group.[17]
- b. No news site reported that the EC group smoked CC more than it vaped EC.
- c. No news site questioned why the impact of the 1.9x difference in CC use was only a 2% increase in HF risk in the Medstar adjusted model.

*Unsupported claims / false conclusions were originated by news media and in one case repeated by another news report.*

3. Two news reports claimed that “vaping, even once, may raise the risk of heart failure. As discussed previously, the impact of a single use of EC product was not studied by the Medstar authors; moreover, the underlying All of Us database did not collect the duration of vaping (see Fig. 5).
  - a. Medical News Today originated this claim on 4/27/24.[36] In an email communication, the Medical News Today author asserted that a statement in the ACC press release (“people who used e-cigarettes at any point had a 19% higher risk of heart failure”) validated their headline.
  - b. This claim was then repeated two days later by CBS News.[3]
4. The Sun reported “VAPING can damage your heart even if you have never smoked cigarettes, according to a study.” [24] As previously discussed, the Medstar authors in actuality reported there was no significant impact in the subset of EC users who didn’t use CC. However, this was disclosed only in the abstract and not the press release.
5. One news site reported that “one in five EC users went on to develop heart failure.” [19] This was likely a misunderstanding of the 19% increased adjusted risk of HF reported in the EC group. In actuality, 1.26% of EC ever-users were diagnosed with heart failure during the prospective period, vs. 1.96% of EC never-users in the unadjusted data.

*One news report acknowledged confirmation bias*

6. Dr. Nicotine Saphier, of Fox News, acknowledged, “This is not surprising.. let's be honest here. It's great news because sometimes we need to point to these studies to really hone this in on people.” [35]

## Discussion

Accurate scientific reporting is critical for informing public health policy and clinical practice. This case study identified instances of omission, unsupported claims, and acknowledgement of confirmation bias in the course of dissemination of data from the underlying database to ultimate news reporting. The central finding was that content which was not in the press release, but only in the abstract or poster presentation, was almost completely ignored in the news reporting.

The broadest qualitative conclusion regarded whether e-cigarettes had utility for quitting smoking. In the poster, the authors indicated that EC use should be discouraged among youth while further studies are conducted. This cautious tone was consistent with the lack of focus of the relative harm of EC use vs. CC use, and the acknowledgment that observational study designs can not prove causality. In the press release, however, this quote was changed to a recommendation that EC not be

used for quitting smoking. Consequently, the second quote was selectively communicated in general news reports and preferentially communicated in science news reports.

In their evaluation of the credibility of the Medstar study, science news sites relied heavily on an assertion that CC smoking was accounted for in the model (mentioned in 59% of reports). However, none of them noted or questioned why a 1.9X difference in CC smoking rates was only modelled as a 2% change in HF rates by the authors. Of note, the Medstar study followed a case-control design. CC exclusive-users were not separately segmented out. Case control studies are especially susceptible to confounding, where the risk associated with one product can be artificially ascribed to the other product in modeling adjustments, which may explain why the risk associated with CC use was so low in the Medstar study.[6]

## Where Did It Go Wrong?

The errors which contributed to many of these news reports were distributed across all stages of the Medstar study, from the underlying database, to the work of the study authors, to the ACC, and finally in the news reporting.

### 1. All of Us Study:

- a. Did not collect EC use duration data

### 2. Abstract / Poster:

- a. Imprecise measurement of EC and CC exposure
  - i. Did not use CC use duration data available from the All of Us database
  - ii. Did not measure tobacco use during the prospective period
  - iii. Used a case-control design which is especially subject to confounding if EC and CC use are not independent of each other
- b. Omitted the finding that CC never use had a non-significant aOR of 1.04 in the poster
- c. Did not directly report the aOR associated with CC use; rather, indirectly reported that 1.9X difference in CC use was accounted for by a 2% change in aOR

### 3. Press Release:

- a. Changed quote from “EC should not be used by youth” to “EC should not be used for stopping smoking” even though the study did not address this.
- b. Did not mention that 1.9X CC use difference between cohorts was “accounted for” as a 2% change in HF risk..
- c. Did however obscure this by stating that “smoking was accounted for”
- d. Omitted that EC users who did not smoke did not show a significant increase in HF risk
- e. Omitted that no dose response was found, in contrast to a previous year press release on the impact of cannabis.[9]

### 4. News Reports

- a. All general news sites, and most science news sites, did not report content which was not in the press release
- b. General news sites in particular relied heavily on quotations from the press release in their reporting

- c. Even the science news sites did not question why CC use was viewed as harmless in this study
- d. News media created and repeated new claim that vaping even once could cause heart failure
- e. News media admitted confirmation bias in their reporting

## What Could Have Helped?

Effective fact-checking could have stanching the bleed at multiple points.

At the media stage, journalists could have:

1. **Cross-referenced the study content, and read it closely:**
  - a. The abstract was available publicly online
  - b. The presentation was available to journalists by request from the authors
2. **Consulted experts who could understand the underlying study design strengths and limitations:** Epidemiologists could have clarified that vaping's risks are dose-dependent and context-specific, and CC use and EC use were not measured precisely.[6] Unfortunately the physician generalists who provided commentary in some news reports did not critique the design, except for repeating from the press release that "this was one of the largest studies of its kind" and acknowledging confirmation bias in one case. Surveys have shown that most physicians are misinformed about nicotine, with the majority thinking it directly causes COPD and cancer, and only a minority thinking it leads to birth defects.[37]
3. **Reported all findings:** Including the non-smoking vapers' null result and the smoking anomaly would have painted a fuller picture, even if less sensational.

At the press release stage, the ACC could have:

1. **Highlighted nuance:** Foregrounding the non-smoking and smoking findings could have forced media to grapple with complexity.

Upstream, the authors could have preempted misinterpretation by not participating in the issuing of a sensationalized press release.. Post-publication, they, as well as the news media, could still issue a statement correcting media distortions—a rare but impactful step.

## Lessons Learned

This case illuminates the fragility of science communication when best practices are disregarded. Each translation stage is a potential fault line where accuracy can fracture under the weight of simplification or sensationalism. The claim that "vaping just once" causes harm lacked evidence but gained traction, while selective reporting distorted public understanding. Thorough fact-checking, using primary sources and expert consultation, is essential. Journalists should investigate more rigorously, and scientists and institutions must prioritize precision. Truth is compromised when urgency and attention-seeking override careful scrutiny.

The net take: does EC use increase HF risk? Nicotine does have known impact on the cardiovascular system, particularly in terms of acute biomarkers like blood pressure and heart rate. It has been known for over a decade that EC, when operated under extreme settings which are not

representative of typical use, can emit high levels of toxicants.[38] E-cigarettes represent a broad category, and use of temperature-regulated and FDA-authorized vaping products can mitigate this.[6,39] The long term impact of EC use remains an important open question, both relative to continued smoking and relative to non-use of nicotine and tobacco products. The overall literature still points to EC use being more harmful than non-use, but dramatically less harmful than CC use, and helpful in quitting smoking.[6,40] Unfortunately, the Medstar study and its subsequent coverage have only muddied the water. The one optimistic note is that this study has shined a light on opportunities for future news reporting to increase its engagement, precision, and accuracy.

## Postscript

As of one year after the ACC press release (4/21/2025), the Medstar study has been cited by at least 3 scientific papers, but has still not yet been published in a peer-reviewed journal.[41–43]

However, a recent (April 2025) study with authors from the American Heart Association (AHA) and Johns Hopkins data-mined the same All of Us database and used a similar prospective approach, segmenting out EC-exclusive users, CC-exclusive users, and EC+CC dual-users.[44] As in the Medstar abstract, the AHA researchers reported that EC exclusive users did not have a significantly higher risk of heart failure compared to EC non-users (they reported a trend towards a 10-18% reduced risk in the EC exclusive users). Again, this material information was critically omitted from the Medstar presentation, the ACC press release, and 100% of news stories covering the Medstar study. Furthermore, in contrast to the Medstar study which modeled the impact of CC use as minimal, the AHA authors did report that exclusive CC use increased HF risk by 50%.

Lastly, however, both studies (Medstar and AHA), could have been more accurate in their analyses by factoring in duration of exposure to tobacco products in the sampled populations. In particular, the dual-use data from the AHA study is uninterpretable without adjusting for any differences in CC exposure in the dual-use vs. CC exclusive-use cohorts. In summary, observational studies of impact of exposure to tobacco and nicotine products should precisely measure the exposure if they wish their results to be accurate, and news reporters should verify this quantification as a standard course of their reporting on these types of studies.[6]

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