

# BMJ Open Impact of adverse media reporting on public perceptions of the doctor–patient relationship in China: an analysis with propensity score matching method

Jing Sun,<sup>1</sup> Shiyang Liu,<sup>1</sup> Qiannan Liu,<sup>1</sup> Zijuan Wang,<sup>1</sup> Jun Wang,<sup>2</sup> Cecile Jia Hu,<sup>3</sup> Mark Stuntz,<sup>4</sup> Jing Ma,<sup>5</sup> Yuanli Liu<sup>1</sup>

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<sup>1</sup>School of Public Health, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China

<sup>2</sup>Institute of Health Economics and Finance, Central University of Economics and Finance, Beijing, China

<sup>3</sup>Deerfield Institute, Shanghai, China

<sup>4</sup>Deerfield Institute, New York, USA

<sup>5</sup>Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts, USA

**Correspondence to** Professor Yuanli Liu; [yliu@pumc.edu.cn](mailto:yliu@pumc.edu.cn)

## ABSTRACT

**Objectives** Numerous studies indicate that the doctor–patient relationship in China is facing serious challenges. This study examined the impact of China Central Television’s negative coverage of high medicines prices on both doctors’ and patients’ opinions of the doctor–patient relationship.

**Setting** Data were collected in a national survey conducted during 19 December 2016 to 11 January 2017 which targeted 136 public tertiary hospitals across the country.

**Participants** All patients and doctors who submitted completed questionnaire were retrieved from the survey database.

**Intervention** The study used propensity score matching method to match the respondents before and after China Central Television’s news report about high medicines prices which was given at 00:00 hours on 24 December 2016.

**Outcome measure** Perception scores were calculated based on the five-point Likert scales to measure the opinions of the doctor–patient relationship.

**Results** The perception scores of the doctor–patient relationship were significantly affected by the negative media coverage for hospitalised patients, who scored 1.18 lower on the doctor–patient relationship following the report ( $p=0.006$ , 95% CI 0.34 to 2.02), and doctors who scored 5.96 points lower on the same scale ( $p<0.001$ , 95% CI 4.11 to 7.82). Score for the ambulatory patients was unaffected by exposure to the adverse news report ( $p=0.05$ ).

**Conclusion** Chinese national media’s reporting of adverse news negatively affected the perceptions of the doctor–patient relationship among both inpatients and doctors. A better understanding of the role of mass media in the formation of opinion and trust between doctors and patients may permit strategies for managing the media, in order to improve public perceptions of the doctor–patient relationship.

## BACKGROUND

Throughout history, the relationship between doctors and patients has been acknowledged as having an important therapeutic effect

## Strengths and limitations of this study

- To our knowledge, this paper presents the first study in China where the propensity score matching method is used to mimic a controlled comparison in an observational study and to analyse the impact of mass media on public perceptions.
- The study design mimics a controlled comparison in a randomised experiment.
- Publication of the article will further promote a robust design for impact analysis of policy interventions in China.
- The study design is theoretically based on several assumptions for performing propensity score matching.
- Adverse effect might be mitigated gradually, and the impact might be underestimated.

irrespective of any prescribed medicines or treatment.<sup>1</sup> Accurate diagnosis and effective treatment rely directly on the quality of the doctor–patient relationship.<sup>2</sup> This relationship is dependent on the medical and the social context. Doctors’ and patients’ ability for self-reflection and communication, as well as technical skills, are embodied within the context of the medical consultation. Within the social context, mass media is a key tool for the public to collect views and shape beliefs and attitudes towards the doctor–patient relationship.<sup>3,4</sup> The public comes to understand the doctor–patient relationship through interpretation of media’s stimuli, involving both recognising and interpreting senses, and finally affecting their behaviours.

The doctor–patient relationship has a special influence on China’s social transformation and healthcare reform, under which China has just entering a preliminary stage of universal coverage of basic healthcare insurance and public health services. Numerous studies indicate that the doctor–patient

relationship in China is facing serious challenges,<sup>5–8</sup> and mass media sometimes has not played a positive role in harmonising the relationship. Although the traditional media are mainly owned by multiple government agencies, an increasing number and diversity of new media has been leading to different styles and flow of ideas in the current Chinese society, and prone to pursuit public attention and chase the eyeball. Doctor–patient relationship is one of appealing topics.<sup>9</sup> Excessive emphasis on the tension between doctors and patients, over rendering the faults have been increasing the antagonism of patients towards doctors.<sup>10</sup> Too much adverse news without in-depth analysis may also lead to resistant emotions which has a negative impact on the public perceptions of the doctor–patient relationship.<sup>11</sup>

The News Channel of China Central Television disclosed the high medicines prices due to unethical relationships between doctors and pharmaceutical companies. Doctors in large public tertiary hospitals get kickbacks (under-the-table payments based on number and value of prescriptions) from pharmaceutical companies, and argued that the costs of kickbacks are absorbed by increased medicines prices, which are passed on health-care systems and patients. It revealed that 20%–40% of the prices of medicines were paid as kickbacks to doctors, and medicines with higher prices are welcomed with higher consumptions in public hospitals.<sup>12</sup> This adverse news reset off a national debate on one of the key issues of China's health systems, that is, affordable healthcare with appropriate price of medicines. As the news report released a clear signal that doctors who get kickbacks are the prime culprit of high medicines price and unaffordable healthcare. This raised serious concerns of the negative impact on the fragile doctor–patient relationship in China, which already suffered from many structural problems in the Chinese health systems. To address the above concerns, this study took the report as typical adverse news and generated evidence of the extent of the effect of such adverse news. The study used a national survey of patients and doctors, and adverse news of China Central Television Station broadcast in the middle of the survey to analyse how the news report affected the public perceptions of the doctor–patient relationship in China.

## METHODS

### Study design

China Healthcare Improvement Evaluation Survey (CHIES) is a national survey which is targeted to both doctors and patients. The CHIES is intended to assess satisfaction among doctors and patients as well as their perceptions of the doctor–patient relationship. The most recent CHIES was carried out from 19 December 2016 to 11 January 2017. During CHIES, the News Channel of China Central Television broadcasted the above adverse news at 00:00 hours on 24 December 2016. The news was continuously repeated as hourly news by all channels of China Central Television afterwards, and dominated

multiple official and unofficial news agencies at all levels across the country over the ensuing 2 weeks, including television, radio, printed media and popular social media, for example, WeChat (a Chinese social media service analogous to Facebook, blog, online fora and podcasts). No other relevant breaking news was broadcasted during the national survey. Assumed that the widely cited news informed all the public, and divided the respondents of CHIES into 'before' and 'after' groups according to their responding times recorded in the survey system, which is a smartphone (or i-pad, computer) based electronic system. To compare the the perception scores of the respondents in the before and after groups, there is a need to control the pretreatment characteristics that influence the treatment outcomes. Propensity score matching (PSM) can help to balance the non-randomly assigned groups by matching a set of covariates (online supplementary appendices 1.1–1.3), which well addressed the problem of confounding by different social, economic, demographic and geographical characteristics of respondents in observational studies. The study compared the respondents' perceptions of the doctor–patient relationship between the matched 'before' and 'after' groups with similar observable characteristics, which mimics a controlled comparison in a randomised experiment.

### Population and setting

This study used data from the doctors and patients surveys of CHIES, which were conducted in 136 public tertiary hospitals in 31 provinces of China from 19 December 2016 to 11 January 2017. At least one provincial general hospital, one provincial traditional Chinese medicine hospital, and one provincial maternal and child hospital were targeted in each province. In addition, all hospitals affiliated with the ministry of health were included as well, which consists of both general and specialty hospitals in major cities across the country. A total of 28 613 complete questionnaires for ambulatory patients, 20 527 questionnaires for hospitalised patients and 19 774 questionnaires for doctors were retrieved from the CHIES database. Among these respondents, 9139 ambulatory patients, 5140 inpatients and 5942 doctors responded before the report; 19 474 ambulatory patients, 15 387 inpatients and 13 832 doctors responded after that the report.

### Measurements

The perceptions of the doctor–patient relationship of respective respondents (ambulatory patients, hospitalised patients and doctors) were identified as the outcome variable and measured with perception scores. CHIES used five-point Likert scales to measure doctors and patients' perceived doctor–patient relationship. It was presented with one statement to all respondents of CHIES as 'I think doctor-patient relationship has been improving over the past two years.' Patients and doctors were asked to rate their perceptions to the statement with 'strongly agree', 'agree', 'neither agree nor disagree', 'disagree' or 'strongly disagree', with 5, 4, 3, 2 and 1 assigned to

each scale, respectively. The responded frequency of each statement was multiplied with the respective assignment value. The results were added up, and divided by the total number of frequencies, and then multiplied by 20 to obtain the centesimal perception score of each statement.

The study included all social, economic, demographic and geographical characteristics of the respondents collected from CHIES (online supplementary appendices 1.1–1.3 for ambulatory patients, hospitalised patients and doctors, respectively) into the propensity score regression model. These were used as the controlled variables for matching analysis.

### Patient and public involvement

Although this is not an actual randomised controlled trial, it still follows some of the requirements to provide necessary information:

- ▶ Before each of the survey questionnaire for outpatients, inpatients and doctors respectively, there were a statement informing the respondents that, the survey was designated by the National Health and Family Planning Commission, and was designed, organised and led by the Peking Union Medical College. The response was anonymous with no identification of individuals. All responded contents will be well kept by the survey organisers.
- ▶ In process of the design of the survey, the research team conducted several rounds of small scale pilots in individual hospitals, patients and doctors' opinions towards the cognitive of survey questions were consulted and reflected.
- ▶ Patients and doctors were not involved in the recruitment process, all respondents were selected according to the sampling strategy of the survey.
- ▶ The results of the survey were disseminated through publication of public accessible survey reports, and the results of this study will be disseminated through publication by academic peer-review journal.
- ▶ The interventions of this study were the news report of the central television station and afterwards citations, which did not leave burden on the study participants.

### Statistical analysis

PSM was used to estimate the true effect of the adverse news on the public's perceived doctor–patient relationship. In this study, the propensity score is the conditional probability for being assigned to 'before' group=1 or 'after' group=0. The propensity scores obtained from the fitted model were used to match the respondents in the 'before' and 'after' groups until achieving accepted balances (independent sample t-test) for all covariates (social, economic, demographic and geographical characteristics of the respondents). Considering that the sample size of each targeted population is over 1500, and the ambulatory patients in the 'before' group almost reached 10 000, the significance level was set at 0.01 for the balance tests of large samples.<sup>13</sup> The most straightforward neighbour matching was performed (1:1, with

replacement, common and ties). To avoid the risk of bad matches if the closest neighbour is too far away, the study imposed a tolerance level on the maximum propensity score distance (calliper=0.25 $\sigma_p$ ).<sup>14</sup> The average effect of the report was calculated as the change of the perception scores between the matched respondents in the 'before' and 'after' groups. To secure the robustness of the estimation, bootstrapping (replications=50) was used to estimate the SE and 95% CI of the average difference between 'before' and 'after' groups. In addition, the study also performed kernel matching (epan for patient samples, bandwidth=0.06; tricube for doctor samples). The same balance check was conducted with independent sample t-test, and compared the estimations with that of the nearest neighbouring matching for sensitivity analysis. STATA V.14.0 was used for all statistical analyses.

### FINDINGS

The social, economic, demographic and geographical characteristics of the respondents in the 'before' and 'after' groups before performing PSM are presented in online supplementary appendices 1.1–1.3. After performing PSM with the nearest neighbouring match, the numbers of respondents in the 'before' and 'after' groups with the propensity scores within the common support (any combination of characteristics observed in the 'before' group can also be observed among the controlled 'after' group) are showed in [table 1](#). The number of off support respondents in the 'before' group was less than 2, and that in the 'after' group was no more than 20. All respondents are within the common support for kernel match. A total of 9137 ambulatory patients, 5139 hospitalised patients and 5942 doctors in the 'before' group were successfully matched with 6370 ambulatory patients, 3701 hospitalised patients and 1662 doctors in the 'after' group. The balance tests of the matched respondents in the 'before' and 'after' groups showed balanced distributions in terms of their demographic, social, economic and geographical characteristics (online supplementary appendices 2.1, 2.3–3.3, all  $p>0.01$ ). There were significant reductions of the bias of estimation after performing PSM, as the means of propensity scores of most covariates reduced over 50%.

As summarised in [table 2](#), the perception scores of the matched ambulatory patients between 'before' and 'after' groups were reduced by 0.61 points ( $p=0.05$ , 95% CI 0.02 to 1.19). Perception scores of the matched hospitalised patients were 1.18 points lower after the report ( $p=0.006$ , 95% CI 0.34 to 2.02), while that of the matched doctors were 5.96 points lower ( $p<0.001$ , 95% CI 4.11 to 7.82). Such results were in line with the results that were obtained from the kernel matching, that is, small reduction of the perception score of the matched ambulatory patients after the report (0.43,  $p=0.09$ , 95% CI 0.06 to 0.93), while that of the hospitalised patients decreased 1.22 points ( $p<0.001$ , 95% CI 0.67 to 1.78) and doctors' perception scores decreased 5.06 points ( $p<0.001$ , 95% CI 4.13 to 5.98).

**Table 1** Number of respondents within and off common support of nearest neighbouring match

Respondents			Off support	On support	Total
Nearest neighbouring match	Ambulatory patients	Before report	2	9137	9139
		After report	18	19 456	19 474
		Total	19	28 593	28 613
	Hospitalised patients	Before report	1	5139	5140
		After report	16	15 371	15 387
		Total	17	20 510	20 527
	Doctors	Before report	0	5942	5942
		After report	17	13 815	13 832
		Total	17	19 757	19 774

### SENSITIVITY ANALYSIS

The study compared the results of nearest neighbouring matching and the kernel matching, and found that the changes of the perception scores between ‘before’ and ‘after’ groups were similar. The perception scores of the matched ambulatory patients, hospitalised patients and doctors between ‘before’ and ‘after’ groups were reduced by 0.43, 1.22 and 5.06 points, respectively ( $p=0.09$ , 95% CI 0.06 to 0.93;  $p<0.001$ , 95% CI 0.67 to 1.78;  $p<0.001$ , 95% CI 4.13 to 5.98). The SEs of the average effects of the adverse news on the perception scores of the respondents based on the kernel matching (0.25, 0.28 and 0.47) for ambulatory patients, hospitalised patients and doctors, respectively) were lower than that based on the nearest neighbouring matching (0.30, 0.43 and 0.94) (table 2). This is because nearest neighbouring matching only considers one observation from the controlled group (after report group), while kernel matching considers multiple observations, larger amounts of information for matching imply lower SE.<sup>15</sup>

### DISCUSSIONS

The adverse news seemed to not have much impact on the perception scores of the ambulatory patients. This is most likely due to the fact that outpatients only have an average of 5 min to communicate with doctors per encounter in the outpatient department of Chinese public tertiary hospitals.<sup>16</sup> There is not enough time for outpatients to sensitise the adverse news and its impact on the doctor–patient relationship. In addition, as there is not yet a matured referral system established in the Chinese health delivery system, the primary care has not obtained general trusts of the public, and most patients do not have fixed doctors. The ambulatory patients in China have high mobility. Comparing with the hospitalised patients and doctors who are not likely to have their care and work environment changed within a short time, ambulatory patients might choose to seek care from trusted hospitals and doctors. This has led to them reacting to the survey without too much negative emotions. While, the hospitalised patients might not be able to shift to other hospitals and other attending doctors within a short time, they

generally stay in hospital for at least several days, and have much longer time for communication with doctors, and more easily to sensitise the adverse news. Once inpatients developed negative perception of doctor–patient relationship after the adverse news, they were more likely to have adverse reactions than ambulatory patients. Doctors are unlikely to change the work environment or to choose patients. Once they formulated a negative perception of the doctor–patient relationship after the adverse news, especially when they met the negatively affected patients, and without appropriate communications, doctors were more likely to react negatively.

China Central Television’s report about the unethical relationship between doctors and pharmaceutical companies had a significant negative impact on doctors’ perception scores. Such negative effects have been greatly enlarged in the current information era, with a fast development of the communication technologies of new media.<sup>17</sup> The self-perceived imbalances between efforts and rewards might significantly erode the morale of physicians and alter their behaviours.<sup>18</sup> Our results are in line with the results of a survey conducted by Dingxiangyuan from 30 December 2016 to 14 January 2017.<sup>19</sup> The Dingxiangyuan survey included 7832 doctors from different levels of care (62% from tertiary hospitals) located in different tiers of cities, covering doctors with different academic ranks at different stages of career development. It asked doctors’ views about the report, and its potential impact on their routine clinical work and personal welfare. Sixty-two per cent felt that the tension between doctors and patients had been intensified after the report; and 51% thought that patients may have poorer medical experiences in public hospitals. Many other studies in China also support the negative impact of mass media’s adverse news on the public perceptions of the doctor–patient relationship. The public opinions about the doctor–patient relationship are influenced by media coverage of relevant news, and how information about doctor–patient relationship is reported and commented on by the media.<sup>20</sup> The way that the news reports portray doctors constructs audience’s perceptions of the real images of doctors.<sup>21 22</sup> The depression

**Table 2** Perception scores of the respondents pertaining to doctor–patient relationship in the before and after report groups before and after performing nearest neighbouring match and kernel match

Matching method	Respondents	Average perception score				Matching results				Bootstrap results				
		Before report group		After report group		Difference	SE	T-stat	P values	Difference	SE	Z values	P values	95% CI (lower, upper)
		Before report group	After report group	Before report group	After report group									
Nearest neighbouring match	Ambulatory patients	Unmatched	77.57	77.54	0.03	0.25	0.12	>0.10	0.61	0.30	2.03	0.05	0.02 to 1.19	
		Matched	77.57	76.96	0.61	0.35	1.74	0.10	0.61	0.30	2.03	0.05	0.02 to 1.19	
	Hospitalised patients	Unmatched	90.26	88.98	1.28	0.20	6.50	0.01	1.18	0.43	2.74	0.006	0.34 to 2.02	
		Matched	90.26	89.73	0.53	0.28	1.85	0.10	1.18	0.43	2.74	0.006	0.34 to 2.02	
Doctors	Unmatched	61.92	56.68	5.24	0.39	13.38	0.01	5.96	0.94	6.31	<0.001	4.11 to 7.82		
	Matched	61.92	55.96	5.96	1.05	5.67	0.01	5.96	0.94	6.31	<0.001	4.11 to 7.82		
Kernel match	Ambulatory patients	Unmatched	77.57	77.54	0.03	0.25	0.12	>0.10	0.43	0.25	1.71	0.09	0.06 to 0.93	
		Matched	77.57	77.14	0.43	0.26	1.68	0.10	0.43	0.25	1.71	0.09	0.06 to 0.93	
	Hospitalised patients	Unmatched	88.25	86.41	1.84	0.27	6.82	0.01	1.22	0.28	4.32	<0.001	0.67 to 1.78	
		Matched	88.25	87.02	1.23	0.28	4.43	0.01	1.22	0.28	4.32	<0.001	0.67 to 1.78	
Doctors	Unmatched	61.92	56.68	5.24	0.39	13.38	0.01	5.06	0.47	10.72	<0.001	4.13 to 5.98		
	Matched	61.92	56.86	5.06	0.39	12.28	0.01	5.06	0.47	10.72	<0.001	4.13 to 5.98		

Differences of perception scores between the before and after news report groups after performing PSM and bootstrap were in bold. PSM, propensity score matching.

of doctors' staff morale intensified the tension between doctors and patients, and caused dual jeopardy to both doctors and patients.

According to McQuail's Social Responsibility theory of mass media, mass media should accept and fulfil certain obligations to society. These obligations are mainly to be met by setting high or professional standards of truth, accuracy, objectivity and balance,<sup>23</sup> which are helpful in fostering a harmonised doctor–patient relationship. To exercise this social responsibility, it is necessary for the mass media to invite professional agencies and experts to elaborate the problem between the two parties; carefully show the images of both doctors and patients objectively and prudently; carry out in-depth investigations with the perspectives of different stakeholders at multiple levels; provide objective and fair information to avoid misleading and organise training to build patient–physician trust and reduce pressure between the two parties.<sup>24</sup>

It is unfortunate that China Central Television's news only presented the problems of high medicines prices, but did not touch on the deep-rooted reasons behind the issues of high medicines prices and doctors getting kickbacks from pharmaceutical companies. As Lo and Grady<sup>25</sup> indicated that it is undoubtedly that payments to physicians by pharmaceutical companies warrant greater concern about conflicts of interest which cause bias and undue influence. One of the major drivers of the tension between doctors and patients in China might be the unhealthy and unethical relations between doctors and pharmaceutical companies, which compromised the public's trust in doctors, harmed both patients and doctors, damaged the doctor–patient relationship and ultimately the whole health system.<sup>26</sup> However, simply disclosing the problem without an in-depth analysis of the reasons behind it would not lead to resolving the problem. Many studies indicate that perverse financial incentives in the Chinese health systems are the root cause of the unethical relationship between doctors and pharmaceutical companies.<sup>27–29</sup> The distorted funding mechanisms (shrinking government subsidies, low priced services and fixed proportion of mark-up on medicines) led to underpayment of public hospitals and doctors through formal channels, and induced the reliance of the whole system on revenues generated by medicines via inappropriate informal channels. Such distortion greatly exacerbated the fragile relationship between doctors and patients, and led to a vicious cycle in the Chinese health system of low public investment, public hospital revenue being linked to prescriptions and illicit payments from pharmaceutical companies under the fierce competition. When illegal and unethical deals became a common practice in the public hospitals, high priced medicines have been favoured by doctors who made biased treatment decisions, which led to high proportion of pharmaceutical expenditures and waste of scarce health resource, affordability problems also occurred and mistrust developed. Currently, the Chinese government has clearly realised such perverse incentives in its health systems,

and implemented a series of reform policies to raise the price schedule of medical services and formal income of doctors, to reduce the medicines expenditures and to shift the provider payment mechanisms to mixed prospective payment, in order to reverse the above perverse incentives, and to build positive economic incentives. If profound analyses were elaborated after the disclosure of the problem, and a clear signal was sent to the public that such unethical practices will be severely punished after rectification of the distorted funding mechanisms, both parties will have more objective understanding of the problem—what should be changed imperatively is the health system. The study would expect a moderate response of both patients and doctors.

Lessons learnt from this case would be that mass media should not automatically assume that high prices of medicines were due to the unethical relationship between doctors and pharmaceutical companies. Such preset positions are prone to offer stereotypes to the public, which has a negative effect on promoting unbiased information. In this case, unilateral criticisms of doctors without in-depth analysis of the deep-rooted reasons behind the presenting problems incurred great depressions of doctors.

The results of our study also imply that in a modern information society, adverse news from the mass media spread widely and rapidly. Careful design of the reporting of adverse news with a professional approach is critical for minimising the potential negative impact. Independent and adequate reporting, and better trained journalists with the capacity to present the news appropriately are all necessary qualifications for the mass media to provide unbiased information and to build positive public opinions.

## LIMITATIONS

One important assumption for performing PSM is that the covariates explain all the pre-existing differences between the respondents in the 'before' and 'after' groups that could affect the perception scores. In reality, the unobservable factors were not accounted for in the matching procedure. Another assumption that the study made for performing PSM is that there are no interactions among the respondents, and the perception scores of the respondents are not affected by the assignment of other participants and other factors unrelated to treatment.<sup>30</sup> In reality, doctors and patients in the same department, in the same hospital, or even within the same city or area may interact with each other about their perceptions of the doctor–patient relationship. Finally, even though the repeated citation of China Central Television report lasted for a half month across all provinces of the whole country, it still might be the case that not all respondents in the 'after' group were aware of this specific news report. Thus, the impact might be underestimated. In addition, the repeated afterwards reporting and citations of the adverse news by other media vehicles already

attached with conceptual knowledge and analysis of the root causes of the high medicines prices, but not merely unilateral criticisms of doctors without any mentioning of systemic reasons. This implies that the adverse effect might be mitigated gradually after the report, and the impact was under estimated.

## CONCLUSIONS

The national mass media's reporting of adverse news had a negative impact on both inpatients and doctors on their perceptions of the doctor-patient relationship, particularly for doctors. In this information age, the rise of information and communication technology promoted faster and wider spread and update of the adverse news. The negative aspects could be fermented in a short period. Strategies for improving doctor-patient relationship might need to be included in media management.

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**Data sharing statement** Additional data of this study are available by emailing [sunjing@sph.pumc.edu.cn](mailto:sunjing@sph.pumc.edu.cn).

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