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To tweet or not to tweet about schizophrenia (TweetSz): study protocol for a randomised controlled trial

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To tweet or not to tweet about schizophrenia (TweetSz): protocol for a randomised controlled trial

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ABSTRACT

Introduction: The Cochrane Schizophrenia Group (CSzG) has produced and maintained systematic reviews of effects of interventions for schizophrenia and related illness. Each review has a Plain Language Summary (PLS) section and an abstract, which are freely available (https://summaries.cochrane.org). Increasingly evidence is distributed using social media (e.g. Twitter and Weibo) alongside traditional publications. We aim to evaluate the impact of tweeting health-related freely available weblinks versus not tweeting on access to the target webpage and/or related web pages

Methods and analysis: In a prospective two-arm, parallel, open randomised controlled trial with a 1:1 allocation ratio, we will allocate 170 published systematic reviews into the intervention group (tweeting arm/Weibo arm) versus the control group (non-tweeting arm). Reviews will be stratified by baseline access activity, defined as high (≥19 views per week, n=14), medium (4.3 to 18.99 views per week, n=72) or low (<4.3 views per week, n=84) based on Google Analytics, which will also be used for evaluating outcomes. The intervention group will have three tweets each day using Hootsuite with a slightly different accompanying text and a shortened relevant Uniform Resource Locator (URL) to the PLS: a) The review title as it appears in summaries.cochrane.org, b) A pertinent extract from the results or discussion sections of the abstract and c) An intriguing question or pithy statement related to the evidence in the abstract. The primary outcome will be: total number of visits to a PLS in seven days following the tweet. Secondary outcomes will include % new visits, bounce rate, pages per visit, visit duration, page views, unique page views, time on page, entrances, exiting behaviour and country distribution.

Ethics and dissemination: This study does not involve living participants and uses information available in the public domain. Participants are *published systematic reviews*. As a result, no ethical approval is required. Dissemination will be via Twitter, Weibo and traditional academic means.

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Twitter is a free to use social media platform, which allows users to send a 140-character message called a 'tweet'. These tweets may contain 'hashtags' (#) and/or a twitter handle (@). # is the means to enable searching for a topic and @ denotes either a username for a person, company or an entity. Presently, there are 284 million monthly active users sending out 500 million tweets a day. 77% of accounts are outside the USA and 80% of tweets are sent from mobile devices,[4]. Over the years, the use of Twitter in healthcare has increased encompassing issues relating to public health surveillance, tracking disease activity of H1N1 pandemic, isolating the source of a cholera outbreak in Haiti amongst others,[5-7]. The promotion of systematic reviews via Twitter however is a relatively recent development for most Cochrane Review Groups,[8] despite health-related Twitter messages comprising a considerable proportion of all Twitter traffic,[9]. 2011 marked the beginning of CSzG

using various social media platforms and since early 2013, the CSzG invested resources into use of social media as a way of raising awareness of systematic reviews. Twitter, the most active of platforms, is now frequently used by both the group and followers. The number of followers of the CSzG on Twitter has risen from 296 (in March 2013) to 734 (as of 15 January 2015).

Although Twitter, Facebook and some other platforms are not available in China, 91% of China's population use social media compared to about 67% of America's,[10]. CSzG has been working with a Chinese company, Systematic Review Solutions Ltd,[11] to disseminate parallel messages on Weibo, a Twitter-like system, to their followers who number more than 6000 currently. Weibo is in the top ten social media sites used in China with over 600 million registered users, of which about 140 million use it regularly (as of March 2014),[12].

Given the increasing use of social media and in particular Twitter in healthcare, we propose to evaluate the impact of tweeting précis of CSzG's systematic reviews in a randomised controlled trial in most of the rest of the world and mirroring this in China on Weibo. The impact of this social media dissemination, however, is unclear. As Twitter does not provide data to enable assessment of impact, Google Analytics (GA) is an alternative source of data. Google Analytics is easy to use and has a wide range of data accessible with the standard (free) account,[13].

This trial aims to evaluate the impact of tweeting health-related web links (freely available on summaries.cochrane.org) versus not tweeting on access to the target webpage and/or related web pages.

METHODS AND ANALYSIS

Study design

Prospective two-arm, parallel, open randomised controlled trial with a 1:1 allocation ratio as outlined below in Figure 1.

Eligibility Criteria

Inclusion criteria

Published full text CSzG reviews in the Cochrane Library and Plain Language. Summary (PLS) in summaries.cochrane.org (N= 170).

Published protocol CSzG reviews that appear in The Cochrane Library.

Any CSzG review not relevant to schizophrenia.

Exclusion criteria

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Unpublished and withdrawn CSzG reviews.

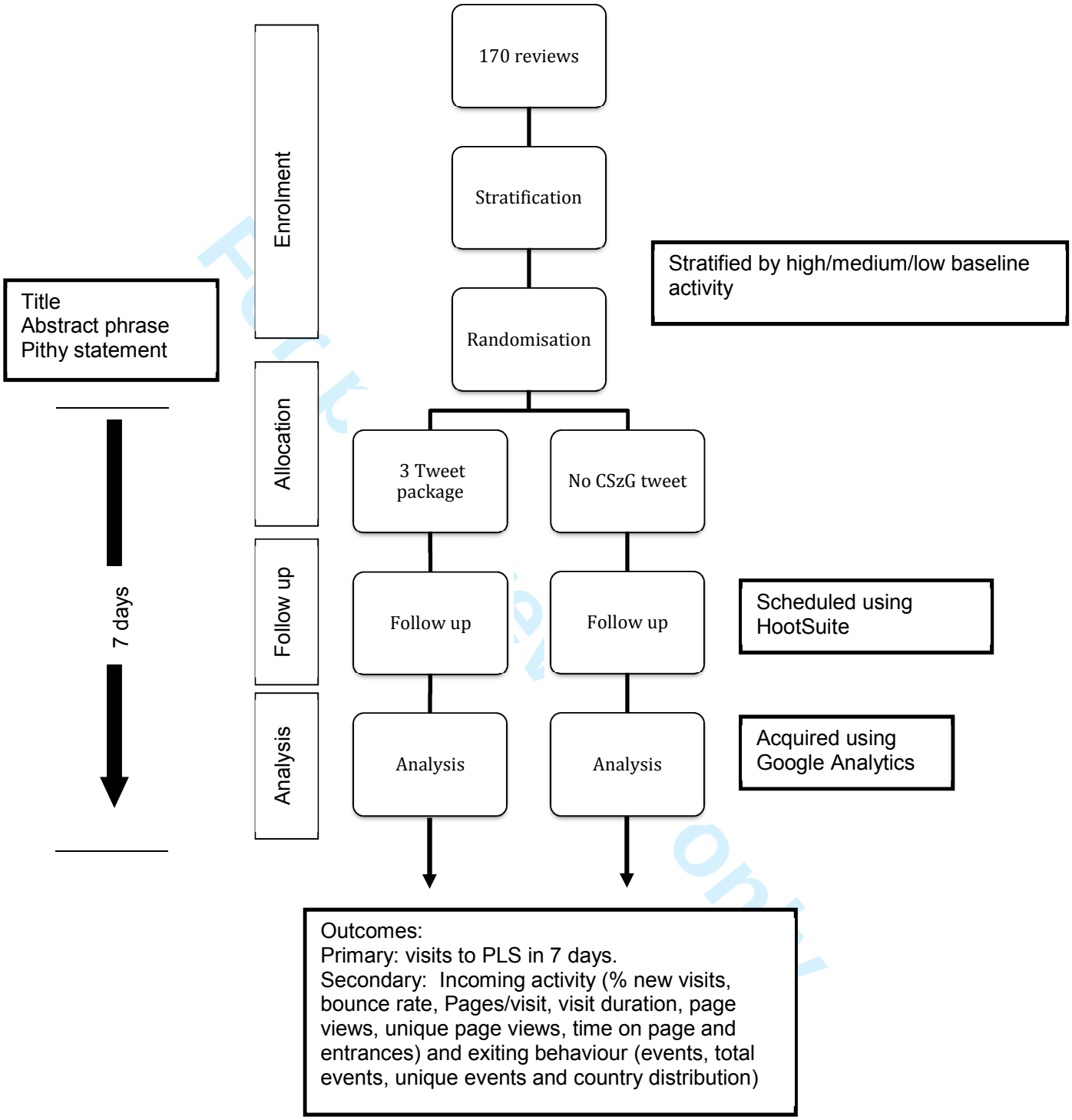

Figure 1: Flow diagram of the study.

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Randomisation

Cochrane Schizophrenia Group systematic review baseline access activity was defined as high (≥19 views per week, n=14), medium (4.3 to 18.99 views per week, n=72) or low (<4.3 views per week, n=84) based on Google Analytics data for the period 21 September 2013 to 28 February 2014. Reviews were given a unique code, which along with access activity stratum, was supplied to one of the authors (AAM) who performed the randomisation. Stratifying by baseline access activity, and using a computer generated random number sequence, reviews were first allocated to Tweet and Non-tweet arms, then into pairs of reviews that would have the same reference period for outcome data collection, then to day of the week (Tuesday, Wednesday or Friday) and week number (1 to 29) that tweeting would begin for reviews in the intervention arm. Finally the sequence of the three tweets for each review (the tweet package) in the intervention arm was also randomised.

Interventions

Intervention group

Reviews in the intervention group will be tweeted three times on the same day at 10:30, 13:00 and 15:00 GMT as guided by the SocialBro web tool, since there is some evidence that multiple postings, 3-4 times a day, of the same or similar tweet can be useful for an international following. Days for tweeting are pre-specified as Tuesday, Wednesday and Friday as these are considered to have the heaviest traffic,[14]. Each of the three tweets has slightly different accompanying text:

- The review **title** as it appears in summaries.cochrane.org – and a shortened URL to the PLS.
- A pertinent **extract** from the results or discussion sections of the abstract – and a shortened URL to the PLS.
- An intriguing **question** or **pithy statement** directly related to the evidence presented in the abstract – and a shortened URL to the PLS.

We are not testing the impact of the different types of accompanying text. These have been formulated in order to appeal to various Followers of the CSzG Twitter page and searchers. We are testing the impact of the package of tweets. To assist the logistics of timing the various tweets, we used Hootsuite, a social media management system. This free package allows formulation and scheduling of Tweets. Hootsuite is now available in China and integrates with Weibo (http://blog.hootsuite.com/chinese-localization-weibo/).

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Control group

Reviews in the control group are those not tweeted by the CSzG.

Outcomes and data collection

The primary outcome is the total number of visits to a PLS in the seven days following commencement of the tweeting intervention. For reviews in the control arm, the outcome period is the same within intervention-control paired reviews. This includes all traffic to the PLS and traffic directly from Twitter. The half-life of a tweet (with a web link), defined as *'the amount of time at which this link will receive half of the clicks it will ever receive after it's reached its peak'*, has been calculated as 2.8 hours,[15]. However, to capture any possible cascade effect of tweeting, we extend the monitoring period to seven days,[16]. Secondary outcomes provide other measures of incoming activity (% new visits, pages per visit, visit duration, page views, unique page views, time on page, entrances, bounce rate) and exiting behaviour (events, total events, unique events).

In addition we will report country distribution of users clicking on PLSs as outlined in the table below.

Source of data

Google Analytics (GA), originally called Urchin before it was signed over to Google in March 2005, will be used as data source for outcomes. GA is mainly used by businesses to identify customers' needs and how those needs are being met. With the production of various data reports in real-time, GA can answer questions about whom, when and where someone has visited a site as well as how they 'arrived' at that site. GA is a good source of user-relevant data accessible with the standard (free) account,[17 18]. Table 1 outlines the glossary of Google Analytics terms.

Statistical considerations: Power

The sample size for this study is fixed by the number of published Cochrane reviews under the jurisdiction within the CSzG (n=170). Therefore we can estimate the magnitude of the detectable between-group difference in the primary outcome. With 5% two-sided alpha and a sample size of 85 per arm, an effect size in the range 0.43 to 0.5 standard deviations is detectable with 80-90% power. This is equivalent to a between-group difference in means of 2.8 to 3.3 visits per week.

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Table 1 Glossary of Google Analytic terms

Google term			Explanation
Number of clicks	**Direct clicks** *- traffic that does not originate from search-engine results or a referring link in a domain is identified as* 'direct',[19].	**Visits**	Number of times people viewed the site
		% New visits	An estimate of the percentage of first time visits
		New visits	Number of first-time visits (from people who had never visited your site before)
		Bounce rate	Percentage of single-page visits (i.e. visits in which the person left the site from the entrance page without interacting with the page).
		Pages/visit	The average number of pages viewed during a visit to the site. Repeated views of a single page are counted (also called Average Page Depth).
		Average visit duration	Average actual length of time a visitor spends on the site,[20]. Google Analytics will record visit duration for a maximum of 30 minutes, after which it will time-out. If the tab is kept open the duration will continue to be monitored until this point,[21].
	All clicks *- the overview of all clicks onto the website of interest,*[19].	**Page views**	Number of pages viewed. Repeated views of a single page are counted.
		Unique page views	Number of visits during which the specified page was viewed at least once. A unique page view is counted for each page URL + page Title combination.
		Average time on page	Average amount of time visitors spend viewing a specified page or set of pages
		Entrances	Number of times visitors entered your site through a specified page or set of pages
		Bounce rate	Percentage of single-page visits (i.e. visits in which the person left the site from the entrance page without interacting with the page).
	Twitter referrals - clicks that originate from a third-party website where a web link has been provided to the page of interest,[21 22].	**Sessions**	Same as Unique page views
		Page views	Number of pages viewed. Repeated views of a single page are counted.
		Average session duration	Same as Average time on page (Only data for the CSzG PLS pages will be recorded)
Outbound Clicks		**Events**	An action tracked on the website – e.g. exit to Cochrane Library
		Total events	Total Events is the number of times events occurred.
		Unique events	Unique Events is the number of visits during which one or more events occurred

Data analysis

We will compare characteristics of the reviews in the intervention and control arms, including baseline access activity, using appropriate descriptive statistics. The primary between-group comparison will analyse reviews as randomised, regardless of how much of the tweeting intervention was actually employed, and will estimate the difference in mean number of visits per week and 95% confidence interval using analysis of covariance. This will be implemented using multivariable linear regression, and will include in the model baseline number of visits and day of the

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week that tweeting activity commenced. Secondary outcomes will be analysed similarly.

As a secondary analysis of the primary outcome, we will conduct a pre-specified subgroup analysis to investigate whether any effect of the intervention differs according to baseline activity. We will do this by including an appropriate interaction term in the primary regression model.

We anticipate that the intervention will be implemented fully as planned, and that there will not be any missing primary outcome data. However in the event that either of these assumptions is untrue, we will consider sensitivity analyses to investigate the effect of the receiving the intervention as intended, and of imputing missing outcome data.

ETHICS AND DISSEMINATION

This study does not involve any living participants and uses information that is available in the public domain. Participants in this study are *systematic reviews* rather than people. The summaries.cochrane.org and The Cochrane Library websites will be the participants, and routine data will be extracted and recorded through Google Analytics. As a result, no ethical approval is required,[23 24]. Results will be disseminated via Twitter, Weibo and traditional academic means.

Trial organisation

The trial is sponsored by the Nottinghamshire Mental Health Trust. We have no support or clear reasons to establish a Data Monitoring Committee or a Steering Committee.

Contributions

MJ and CEA designed the protocol and drafted the manuscript. AB helped allocate with categorising the reviews and setting up Hootsuite. AAM provided statistical advice and revision of manuscript. SZ is co-ordinating the China arm of the trial and contributed to revising the manuscript. SS contributed to drafting the protocol and revisions. All authors are accountable for accuracy and integrity of the work. All authors read and approved the final manuscript.

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Competing interests

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We are not aware of any competing interests.

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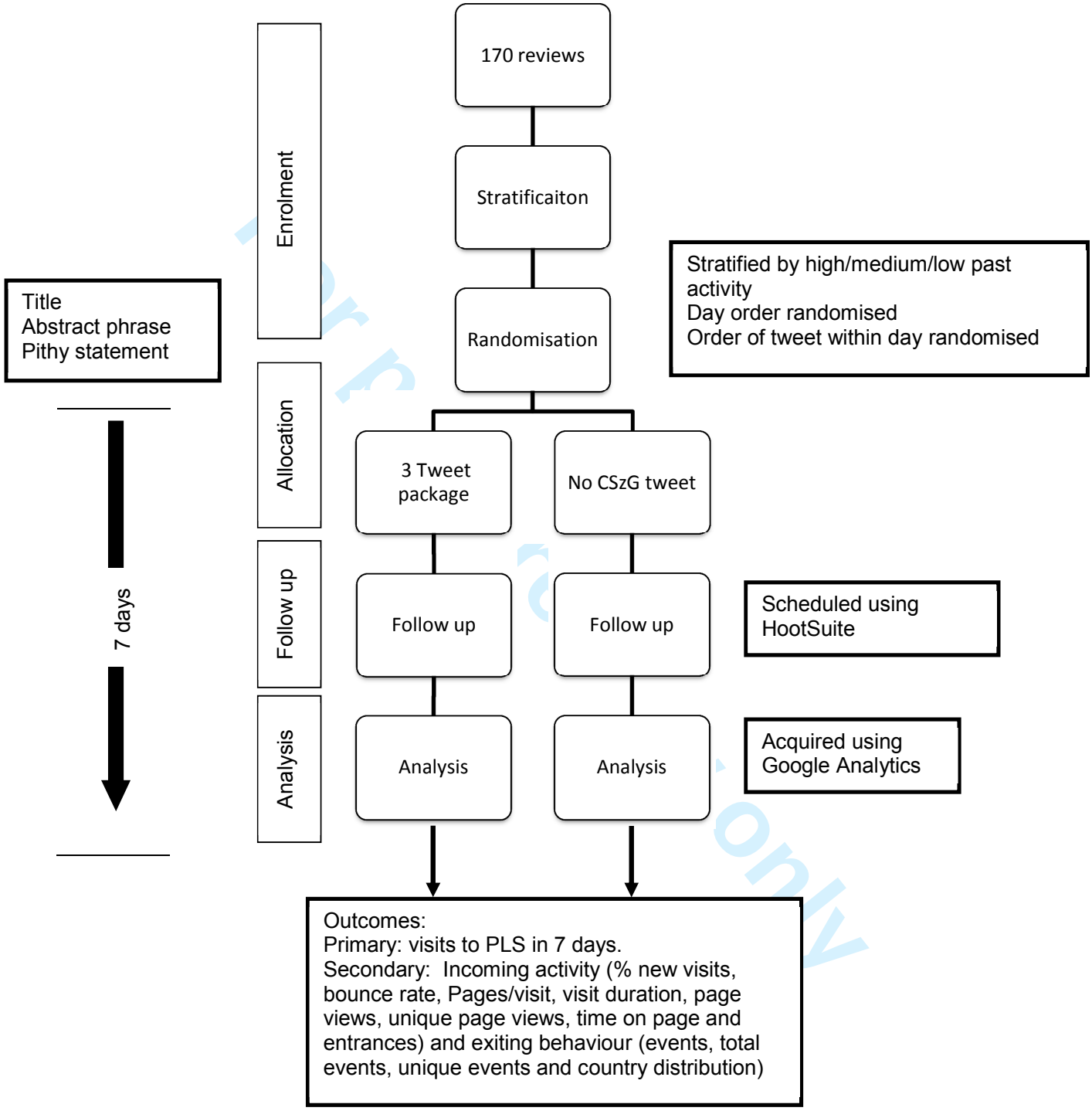

Figure 1: Figure 1: Flow diagram of the study

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Unpublished and withdrawn CSzG reviews.

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Published protocol CSzG reviews that appear in The Cochrane Library.

Any CSzG review not relevant to schizophrenia.

Randomisation

Cochrane Schizophrenia Group systematic review baseline access activity was defined as high (≥19 views per week, n=14), medium (4.3 to 18.99 views per week, n=72) or low (<4.3 views per week, n=84) based on Google Analytics data for the period 21 September 2013 to 28 February 2014. This classification was based on data exported from Google Analytics on number of views within the pilot period (about 3 months) and deciding on a suitable division into categories based on a reasonable definition of high, medium and low 'popularity' in terms of this data. This categorisation was then checked by CEA and AAM to ensure there was an even number of reviews within each category in order do the pairing. Reviews were given a unique code, which along with access activity stratum, was supplied to one of the authors (AAM) who performed the randomisation. Stratifying by baseline access activity, and using a computer generated random number sequence, reviews were first allocated to Tweet and Non-tweet arms, then into pairs of reviews that would have the same reference period for outcome data collection, then to day of the week (Tuesday, Wednesday or Friday) and week number (1 to 29) that tweeting would begin for reviews in the intervention arm. Finally the sequence of the three tweets for each review (the tweet package) in the intervention arm was also randomised.

Interventions

Intervention group

Reviews in the intervention group will be tweeted three times on the same day at 10:30, 13:00 and 15:00 GMT as guided by the SocialBro web tool, since there is some evidence that multiple postings, 3-4 times a day, of the same or similar tweet can be useful for an international following. Days for tweeting are pre-specified as Tuesday, Wednesday and Friday as these are considered to have the heaviest traffic,[14]. Each of the three tweets has slightly different accompanying text:

- The review **title** as it appears in summaries.cochrane.org – and a shortened URL to the PLS.
- A pertinent **extract** from the results or discussion sections of the abstract – and a shortened URL to the PLS.

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- An intriguing **question** or **pithy statement** directly related to the evidence presented in the abstract – and a shortened URL to the PLS.

An example of this is outlined in Figure 2.

We are not testing the impact of the different types of accompanying text. These have been formulated in order to appeal to various Followers of the CSzG Twitter page and searchers. We are testing the impact of the package of tweets. To assist the logistics of timing the various tweets, we used Hootsuite, a social media management system. This free package allows formulation and scheduling of Tweets. Hootsuite is now available in China and integrates with Weibo (http://blog.hootsuite.com/chinese-localization-weibo/).

Control group

Reviews in the control group are those not tweeted by the CSzG.

Outcomes and data collection

The primary outcome is the total number of visits to a PLS in the seven days following commencement of the tweeting intervention. For reviews in the control arm, the outcome period is the same within intervention-control paired reviews. This includes all traffic to the PLS and traffic directly from Twitter. The half-life of a tweet (with a web link), defined as *'the amount of time at which this link will receive half of the clicks it will ever receive after it's reached its peak'*, has been calculated as 2.8 hours,[15]. However, to capture any possible cascade effect of tweeting, we extend the monitoring period to seven days,[16]. Secondary outcomes provide other measures of incoming activity (% new visits, pages per visit, visit duration, page views, unique page views, time on page, entrances, bounce rate) and exiting behaviour (events, total events, unique events).

In addition we will report country distribution of users clicking on PLSs in a separate table.

Source of data

Google Analytics (GA), originally called Urchin before it was signed over to Google in March 2005, will be used as data source for outcomes. GA is mainly used by businesses to identify customers' needs and how those needs are being met. With the production of various data reports in real-time, GA can answer questions about whom, when and where someone has visited a site as well as how they 'arrived' at that site. GA is a good source of user-relevant data accessible with the standard (free) account,[17 18]. Table 1 outlines the glossary of Google Analytics terms.

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Statistical considerations: Power

The sample size for this study is fixed by the number of published Cochrane reviews under the jurisdiction within the CSzG (n=170). Therefore we can estimate the magnitude of the detectable between-group difference in the primary outcome. With 5% two-sided alpha and a sample size of 85 per arm, an effect size in the range 0.43 to 0.5 standard deviations is detectable with 80-90% power. This is equivalent to a between-group difference in means of 2.8 to 3.3 visits per week.

Table 1: Glossary of Google Analytic terms

Google term			Explanation
Number of clicks	**Direct clicks** *- traffic that does not originate from search-engine results or a referring link in a domain is identified as* 'direct',[19].	**Visits**	Number of times people viewed the site
		% New visits	An estimate of the percentage of first time visits
		New visits	Number of first-time visits (from people who had never visited your site before)
		Bounce rate	Percentage of single-page visits (i.e. visits in which the person left the site from the entrance page without interacting with the page).
		Pages/visit	The average number of pages viewed during a visit to the site. Repeated views of a single page are counted (also called Average Page Depth).
		Average visit duration	Average actual length of time a visitor spends on the site,[20]. Google Analytics will record visit duration for a maximum of 30 minutes, after which it will time-out. If the tab is kept open the duration will continue to be monitored until this point,[21].
	All clicks *- the overview of all clicks onto the website of interest,*[19].	**Page views**	Number of pages viewed. Repeated views of a single page are counted.
		Unique page views	Number of visits during which the specified page was viewed at least once. A unique page view is counted for each page URL + page Title combination.
		Average time on page	Average amount of time visitors spend viewing a specified page or set of pages
		Entrances	Number of times visitors entered your site through a specified page or set of pages
		Bounce rate	Percentage of single-page visits (i.e. visits in which the person left the site from the entrance page without interacting with the page).
	Twitter referrals - clicks that originate from a third-party website where a web link has been provided to the page of interest,[21 22].	**Sessions**	Same as Unique page views
		Page views	Number of pages viewed. Repeated views of a single page are counted.
		Average session duration	Same as Average time on page (Only data for the CSzG PLS pages will be recorded)
Outbound Clicks		**Events**	An action tracked on the website – e.g. exit to Cochrane Library
		Total events	Total Events is the number of times events occurred.
		Unique events	Unique Events is the number of visits during which one or more events occurred

Data analysis

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We will compare characteristics of the reviews in the intervention and control arms, including baseline access activity, using appropriate descriptive statistics. The primary between-group comparison will analyse reviews as randomised, regardless of how much of the tweeting intervention was actually employed, and will estimate the difference in mean number of visits per week and 95% confidence interval using analysis of covariance. This will be implemented using multivariable linear regression, and will include in the model baseline number of visits and day of the week that tweeting activity commenced. Secondary outcomes will be analysed similarly.

As a secondary analysis of the primary outcome, we will conduct a pre-specified subgroup analysis to investigate whether any effect of the intervention differs according to baseline activity. We will do this by including an appropriate interaction term in the primary regression model.

We anticipate that the intervention will be implemented fully as planned, and that there will not be any missing primary outcome data. However in the event that either of these assumptions is untrue, we will consider sensitivity analyses to investigate the effect of the receiving the intervention as intended, and of imputing missing outcome data.

ETHICS AND DISSEMINATION

This study does not involve any living participants and uses information that is available in the public domain. Participants in this study are *systematic reviews* rather than people. The summaries.cochrane.org and The Cochrane Library websites will be the participants, and routine data will be extracted and recorded through Google Analytics. As a result, no ethical approval is required,[23 24]. Results will be disseminated via Twitter, Weibo and traditional academic means.

Trial organisation

The trial is sponsored by the Nottinghamshire Mental Health Trust. We have no support or clear reasons to establish a Data Monitoring Committee or a Steering Committee.

Contributions

MJ and CEA designed the protocol and drafted the manuscript. AB helped allocate with categorising the reviews and setting up Hootsuite. AAM provided statistical advice and revision of manuscript. SZ is co-ordinating the China arm of the trial and contributed to revising the manuscript. SS contributed to drafting the protocol and

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revisions. All authors are accountable for accuracy and integrity of the work. All authors read and approved the final manuscript.

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Competing interests

We are not aware of any competing interests.

Figure Legends

Figure 1: Flow diagram of the study.

Figure 2. Example of the three tweets relating to same review

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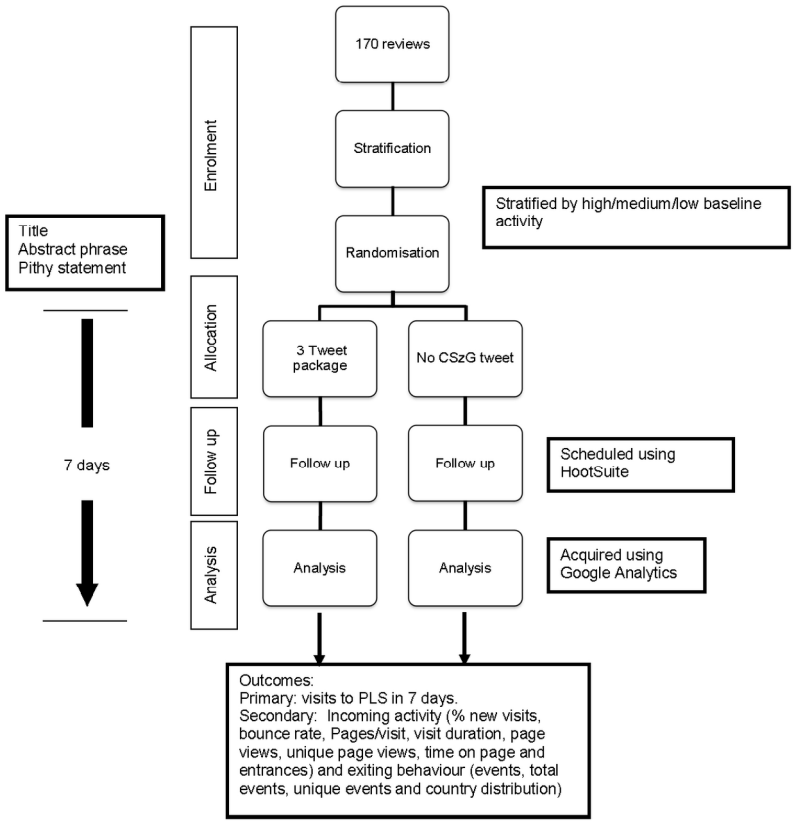

Figure 1: Flow diagram of the study.

Figure 1: Flow chart
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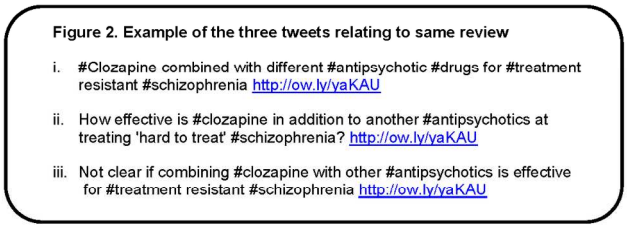
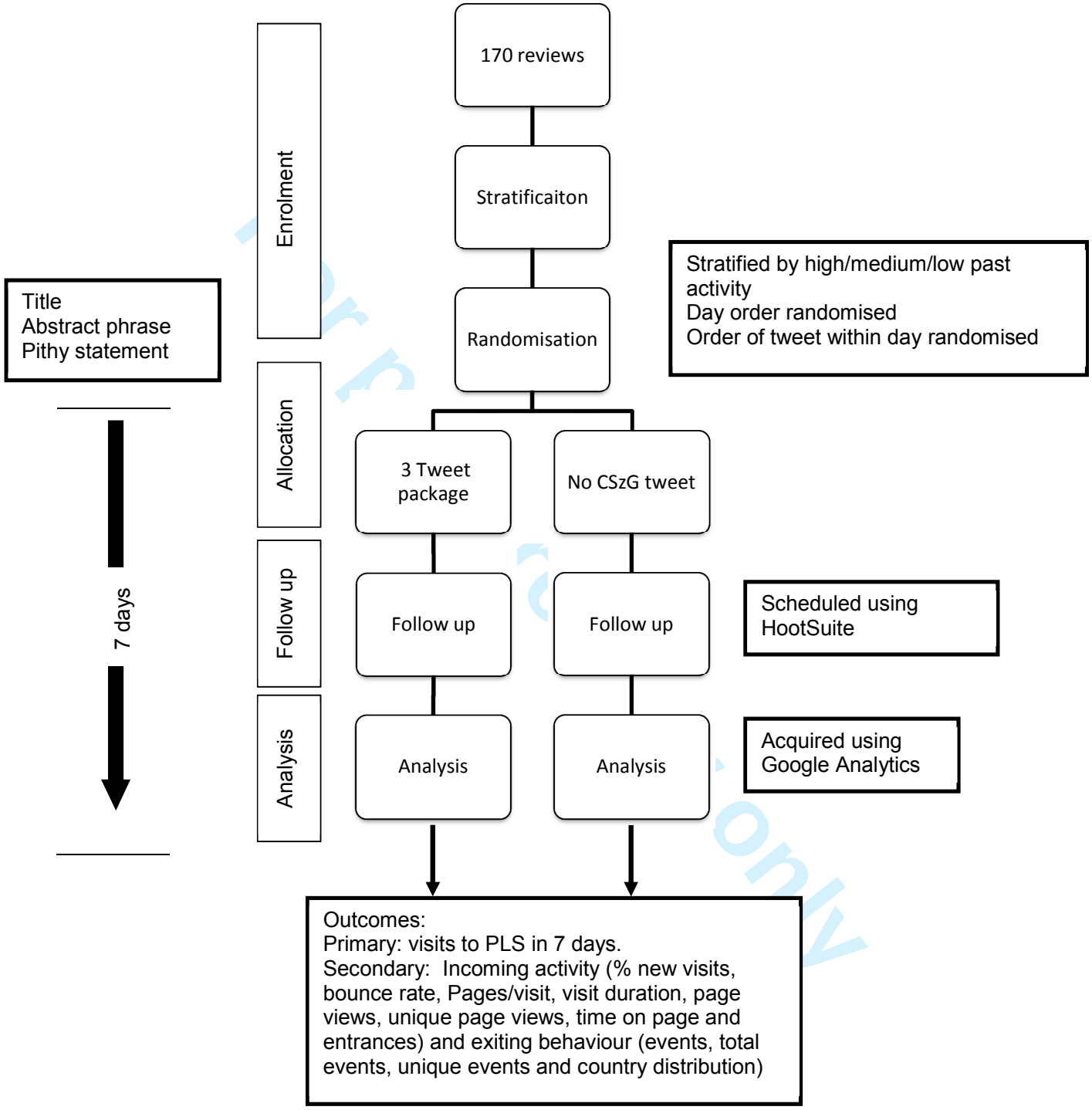


Figure 2: Example of the three tweets relating to same review
210x297mm (300 x 300 DPI)



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