

The influence of social media on recruitment to surgical trials.

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Abstract

Background Social media is changing the way surgeons communicate worldwide with a key role in disseminating trial results. However, it is unclear if social media could be used in recruitment to surgical trials. This study aimed to investigate the influence of Twitter in promoting surgical recruitment in The Emergency Laparotomy and Frailty (ELF) Study.

Methods The ELF Study was a UK prospective, observational cohort that aimed to assess the influence of frailty on 90-day mortality in older adults undergoing emergency surgery. A power calculation required 500 patients to be recruited in 12 weeks to detect a 10% change in mortality associated with frailty. A Twitter handle was designed (@ELFStudy) with eye-catching logos to encourage enrolment and inform the public and clinicians involved in the study. Twitter Analytics and an online analytics tool (Twitonomy; Digonomy Pty Ltd) were used to analyse trends in user engagement.

Results After 90 days of data collection, a total of 49 sites from Scotland, England and Wales recruited 952 consecutive patients undergoing emergency laparotomy. Target recruitment (n=500) was achieved by week 11. A total of 591 tweets were published by @ELFStudy since its conception, making 218,136 impressions at time of writing. The number of impressions prior to March 20 th 2017 (study commencement date) was 23,335 (343.2 per tweet), compared to the recruitment period with 114,314 impressions (256.3 per tweet), ending on June 20 th 2017. Each additional tweet was associated with an increase in recruitment of 1.66 (95%CI 1.36 to 1.97; p<0.001). **Conclusion** The ELF Study over-recruited by nearly 100%, reaching over 200,000 people across the U.K. Branding enhanced tweet aesthetics and helped increase tweet engagement to stimulate discussion and healthy competition amongst clinicians to aid trial recruitment. Other studies may draw from the social media experiences of the ELF Study to optimise collaboration amongst researchers. **Trial Registration** This study is registered online at www.clinicaltrials.gov (registration number NCT02952430) and has been approved by the National Health Service Research Ethics Committee.

Background

Social media is the term used to describe the interactive, web-based free applications, that have been instrumental in increasing accessibility of information by allowing instantaneous worldwide communication. The reach of social media in modern society is extensive, with an estimated 2.46 billion users of any social media application reported in 2017¹.

One of these applications is Twitter (Twitter Inc, San Francisco, CA, USA): an online micro-blogging site which limits messages (or 'tweets') to 140 characters or less, and may be attached to an image or website link and can connect to other notable Twitter users/institutions by 'tagging' and thereby including other users. Twitter is an ideal social media modality to convey concise messages on a public platform, is free at point of service and is often used professionally to represent the views of that user or institution. Social media usage is often associated with increasing engagement with professional bodies and

surgical societies such as the Association of Coloproctologists' of Great Britain and Ireland (ACPGBI)². There is also some evidence to suggest that the age of the user will affect platform preference in social media usage, for example amongst emergency medicine physicians, trainees tended to use Facebook and YouTube, whilst older, more experienced physicians used Twitter and LinkedIn³. Whether or not this is true of general surgery is yet to be established.

In surgery, the role of social media is evolving, with reported beneficial effects including: facilitating patient education, sharing information on new guidelines or published research and increasing collaboration amongst stakeholders such as: patients, clinicians, industry, trainees and educational institutions^{4,5}.

These benefits to research raise the question of the influence of social media on performing research, in particular: recruitment to trials. It is anticipated that recruitment to research trials using social media may substantially increase recruitment numbers in a cost-effective manner⁶. Little is known in this area, however social media outlets such as Twitter could facilitate recruitment specifically to surgical trials and engagement in research, such as that seen in the National Audit of Small Bowel Obstruction study (NASBO)⁷. This study demonstrated that tweets which involved images and tagged other users, led to higher levels of engagement with tweets and maintained collaborator engagement. Unfortunately within surgical research, use of social media is variable amongst different specialties in the UK including: colorectal surgeons (3.1%)², vascular surgeons (4.8%)⁷ and plastic surgeons (22%)⁸, which overall seems low in comparison to the estimated 1 in 5 doctors in the UK using Twitter on a daily basis⁹.

The Emergency Laparotomy and Frailty (ELF) Study was a multi-disciplinary, multicentre prospective cohort study undertaken in the UK in 2017¹⁰. Using Twitter (@ElfStudy) to advertise for site registration and patient recruitment, The ELF Study achieved its target recruitment early, reporting significant over-recruitment at completion. This study considers the influence of social media on ELF Study's recruitment success and offers insight on how to harness social media outlets such as Twitter, to promote multi-disciplinary and multi-centre collaboration using a branding strategy.

Methods

The ELF Study investigated the relationship to pre-operative frailty and mortality at 90-days in older adults undergoing emergency laparotomy in the U.K. (trial registration number NCT02952430). Consecutive patient recruitment was performed for 3 months (20th March 2017–20th June 2017) with each patient subsequently followed up for 90-days. Target recruitment was calculated with 500 patients anticipated to detect a 10% change in mortality associated with frailty. Ethical approval was given by the National Health Service Research Ethics Committee, with central registration at the Health Research Authority (HRA) for English sites, NHS Research Scotland Permissions Coordinating Centre (NRSPCC) for Scottish sites and Health and Care Research Permissions Service for Welsh sites¹¹.

Twitter handle @ElfStudy was opened (8th June 2017) with eye-catching and consistent branding used to advertise for site registration prior to the recruitment period. The Twitter account @ELFStudy was utilised by the ELF Steering Group to provide public information on: study recruitment requirements, updates on data collection sparking regional and hospital-based light-hearted competition, sharing links to related research articles of interests and presentations by the steering group on provisional ELF Study results at general surgery, geriatrics and anaesthetic research meetings.

Data Analysis

Tweets published by @ELFStudy were divided into two time phases to allow comparison to weekly recruitment figures: 1) pre-trial commencement (pre-trial phase), 2) trial commencement and data collection (recruitment phase). Tweets after these time phases were excluded.

Definitions

Twitter Analytics and an online analytics tool (Twitonomy; Digonomy Pty Ltd) were used to examine trends in user engagement. Table 1 describes definitions used in Twitter analytics.

Table 1
Definitions used in Twitter Analytics

Analytical Tool	Definition
Impressions	Number of times users see a particular tweet
Engagements	Total number of times a tweet was interacted with (including users opening a link, re-tweeting, replies to tweets, 'likes')
Re-tweet	The forwarding of an original tweet to another user's profile, sharing information with other users
Likes	Users indicate they agree with the sentiment of tweet content
Followers	Number of users who receive updates on a particular account's posts (i.e. the greater number of followers, the greater the likelihood of higher tweet engagement)
Tags / Tagging	Including another user in Tweet content and/or directing a message at another user, often increasing the engagement of the Tweet e.g. @ELFStudy
Hashtags	'Tagging' groups a collection of tweets with similar content so that users may find a common thread of tweets on a similar topic e.g. #colorectalsurgery, #surgicaltraining

Outcome and exposure

Exposure of social media was defined in three ways: the total number of tweets by @ELFStudy; the total number of the impressions and engagements of each tweet; and the maximum amount of impressions and engagements with a single tweet in the week, cumulative recruitment and number of tweets were our

primary measures of outcome and exposure. We excluded the final week when the study ended to reflect that specific sites had been collating recruitment and was not reporting these on the RedCap database.

Statistical Analysis

For the 12 weeks of the study, we fitted a linear regression to model cumulative recruitment. To assess the additional impact of the social media campaign we fitted: sum of engagement; and total cumulative number of tweets as two independent analyses. The different models were compared using the adjusted coefficient to determination (adjusted r^2) summary. The slope parameter will be presented alongside the 95% Confidence interval and p-value.

Results

Study Recruitment

A total of 52 sites registered with 49 submitting data. The target recruitment ($n = 500$) was achieved by week 11 with recruitment increasing exponentially from week 11 to almost double the intended target by week 12 ($n = 952$) [Figure 1]. A total of 926 tweets were published by @ELFStudy during the pre-trial (phase 1) and recruitment phases (phase 2).

Impressions and Engagements

The number of phase 1 tweets was 59, resulting in 23,335 impressions (343.2 per tweet) versus 437 tweets published in phase 2 generating 114,314 impressions (256.3 per tweet) (Fig. 1). The number of engagements during phase 1 was 1124, compared to 4523 engagements in phase 2, with the recruitment phase seeing four times the number of tweet engagements of that seen in the pre-trial phase (Fig. 2). This suggests that users were engaging more with tweets published by @ELFStudy during the recruitment phase, possibly reflecting increased overall recruitment of patients.

Week 6 marked the time period where recruitment exceeded the target prediction, however this did not bear correlation to the number of tweet engagements (Fig. 3) and impressions (Fig. 4).

Interestingly from week 11, the number of impressions and engagements markedly increased perhaps reflecting the 'final push' effect of individual sites logging data. This is reflected by the overall number of tweets published by @ELFStudy, which predictably had a large amount of activity at the beginning and latter stages of the recruitment phase, with a moderate number of tweets published in the mid-way point (Fig. 5).

Data Analysis

We present the aggregate results of the social media data and weekly recruitment data (Table 2). From this there appears a temporal effect of week.

Table 2
Weekly recruitment comparison with tweet engagement

Week	Weekly recruitment	Weekly number of tweets	Weekly Total Engagements	Cumulative Recruitment	Cumulative number of tweets
1	30	30	553	30	30
2	28	55	384	58	85
3	41	61	470	99	146
4	23	8	18	122	154
5	49	56	448	171	210
6	56	20	164	227	230
7	67	33	50	294	263
8	69	23	103	363	286
9	45	30	426	408	316
10	62	20	182	470	336
11	37	15	160	507	351
12	100	35	552	607	386

Figure 1

Comparison of Total Impressions during Phase 1 (pre-trial) & Phase 2 (recruitment phase)

Statistical Analysis

After fitting the two linear regressions, it was clear that the cumulative number of tweets was associated with the cumulative recruitment (Fig. 6). It was found that the adjusted- $r^2 = 0.94$. and each additional tweet was associated with an increase in recruitment of 1.66 (95% CI 1.36, to 1.97; $p < 0.001$). There was no association between the cumulative engagement and cumulative recruitment.

Discussion

Social media has revolutionised academia and the distribution of information. Not only do social media outlets such as Twitter inform users of trial updates, it also has a potential role in changing clinical practice with trial conclusion. The vast online network connects users of the platform across the globe instantaneously to discuss a common theme and share experiences, particularly with the use of hashtags which group together messages that may be followed more easily by users who search for that hashtag item (e.g. #colorectalresearch).

Part of the successful social media recruitment drive to this study was undoubtedly due to the non-professional marketing strategy of the ELF Study, which played upon a Christmas theme in keeping with its namesake. Consistent use of a Christmas colour scheme and themed logo made the study more visible amongst its peers and was easily identifiable when presented at meetings as oral and poster presentations (Fig. 1). This reflects standardised marketing strategies by other major industries which recognise that consumer participation increases engagement quality and experiences¹². With increasing popularity of Twitter profiles for research trials, it is becoming more difficult to 'stand out' and have a visible online presence¹³. Creative strategies in advertising which engage consumers recognise: 'play on words' appeal (e.g. ELF), animation (e.g. use of GIFs and other illustrations) and social appeal (e.g. as part of the increasing spread of multi-centre, multi-author collaborative studies) as being highly influential factors which increase consumerism^{14, 15}.

The successes of the ELF Study in recruiting patients ahead of time, and in excess, may be reflected by the findings of Nowotarski et al, who found that of 179 adults recruited for a medical trial, only 30% were aware of information providing clinical trial websites (e.g. clinicaltrials.gov). Once these adults were informed of the online network available for trial recruitment, 81% showed interest in engaging with relevant clinical trials¹⁶. Therefore, social media may not only educate the public and clinicians on potential trials of interest, but the open manner with which information is received may increase engagement, as users have a direct contact (or a 'face') they can seek further information from. This openness is further enhanced by collaboration and sharing of information, allowing multi-centre studies to communicate both individually and collectively with each participating site to identify problems with trial protocol, trial recruitment and to instil a sense of 'healthy competition', where sites could compete for optimal trial recruitment and participation.

Twitter was the only social media modality used for the ELF Study and this paper, given the high level of professional usage within the outlet, in comparison to other platforms which have not been examined as part of this study, which many users have for personal and not professional reasons². As is true with all social media modalities which are instantaneous, in comparison to traditional industrial media (e.g. printed news, television), communications such as tweets may be altered at any time and 'deleted', meaning that social media data may be viewed as less 'permanent' than industrial level media¹⁷. In order to ethically manage this and moderate pages, several boards have drawn consensus on moderating the use of social media platforms for professional purposes such as the General Medical Council (UK). There is increasing governance over content of social media posts in medicine, particularly relating to patient confidentiality, or other violations of professionalism such as: inappropriate contact with patients, declaring conflicts of interest and maintaining professionalism amongst colleagues and other users¹⁸.

Conclusion

The ELF Study is a multi-disciplinary, multi-centre trial whose success was undoubtedly assisted by social media and non-professional marketing. Eye-catching logos and consistent colour schemes

enhanced tweet aesthetics and helped increase tweet engagement to stimulate discussion and healthy competition amongst clinicians to aid trial recruitment.

Social media usage in surgical research is becoming standard, however its role in other medical specialties is still to be explored and utilised; including geriatric medicine where there is no current evidence to demonstrate clinician engagement and patterns of usage. The ELF Study achieved target recruitment within half of the predicted time period, a feat not to be underestimated. Other studies may draw from the social media experiences of the ELF Study, including: regular updates to inform participants of study progress, successful 'branding' playing on the study acronym and ultimately engaging a multi-disciplinary platform of: physicians, surgeons and anaesthetists to collaborate and produce high quality peri-operative outcomes data.

Abbreviations

ELF

Emergency Laparotomy and Frailty Study

ACPGBI

Association of Coloproctology of Great Britain and Ireland

NASBO

National Audit of Small Bowel Obstruction study

HRA

Health Research Authority

NRSPCC

NHS Research Scotland Permissions Coordinating Centre

Declarations

a. Ethical Approval

Ethical approval was obtained from National Health Service Research Ethics Committee (Black Country Research Committee: November 2016; 16/WM/0500). The study was registered centrally with the Health Research Authority (England), the NHS Research Scotland Permissions Co-ordinating Centre (Scotland), and the Health and Care Research Permissions Service (Wales). The ELF study was registered online at www.clinicaltrials.gov (NCT02952430). The ELF Study did not require consent for participation as it was a prospective audit of practice, with no direct clinical impact upon participants.

b. Consent for Publication

Not applicable.

c. Availability of data and material

The datasets used and/or analysed during the current study are available via Twitter Analytics and Twitonomy, or from the corresponding author on reasonable request.

d. **Competing interests**

The authors declare that they have no competing interests.

e. **Funding** The ELF Study was funded by the Bowel Disease Research Foundation (BDRF). The funding body had no influence on the design of the study, data collection and analysis or manuscript submission.

f. **Authors' contributions**

CB, BC, KP, JH and SM analysed and interpreted social media data. CB, BC, JL and SM were major contributors in writing the manuscript. BC was responsible for statistical analysis. All authors read and approved the final manuscript.

g. **Acknowledgements**

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Figures

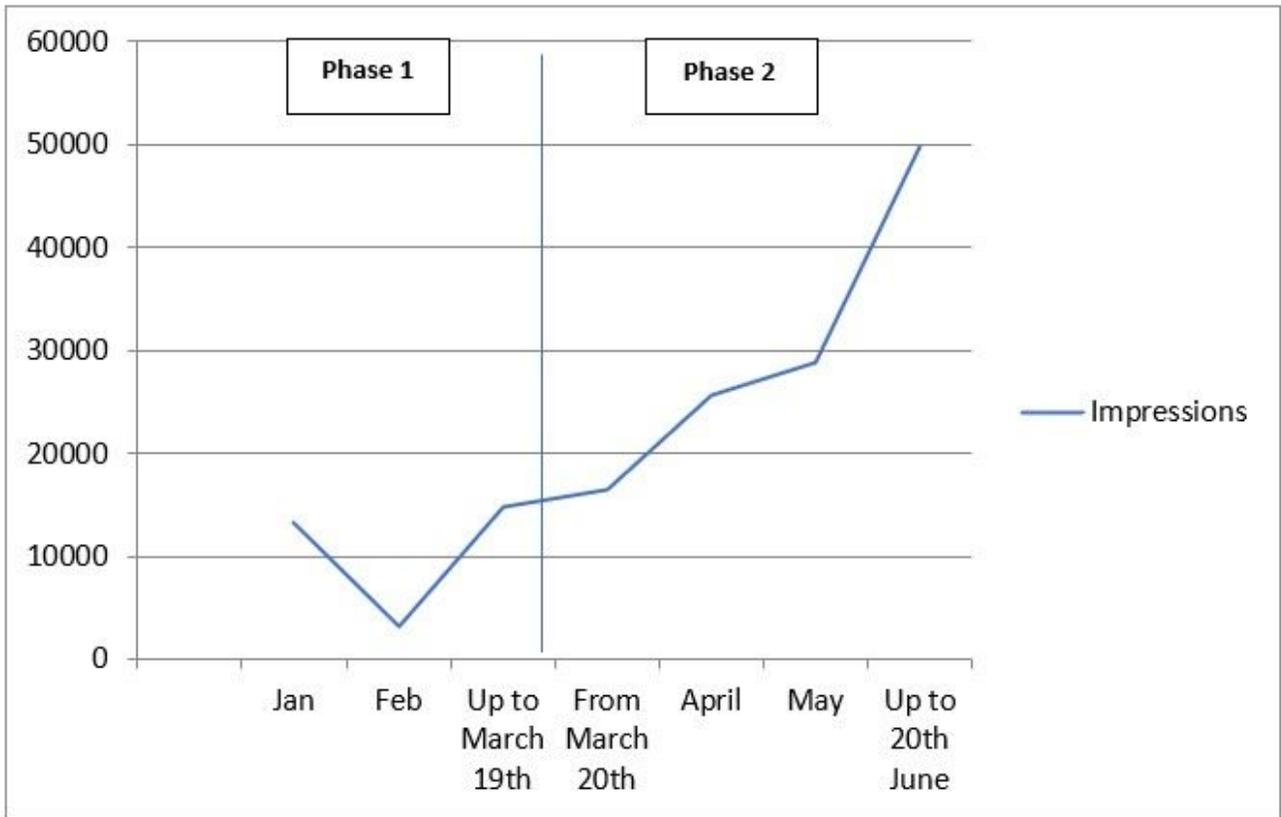


Figure 1

Comparison of Total Impressions during Phase 1 (pre-trial) & Phase 2 (recruitment phase)



Figure 2

Comparison of Engagements during Phase 1 (pre-trial) & Phase 2 (recruitment phase)

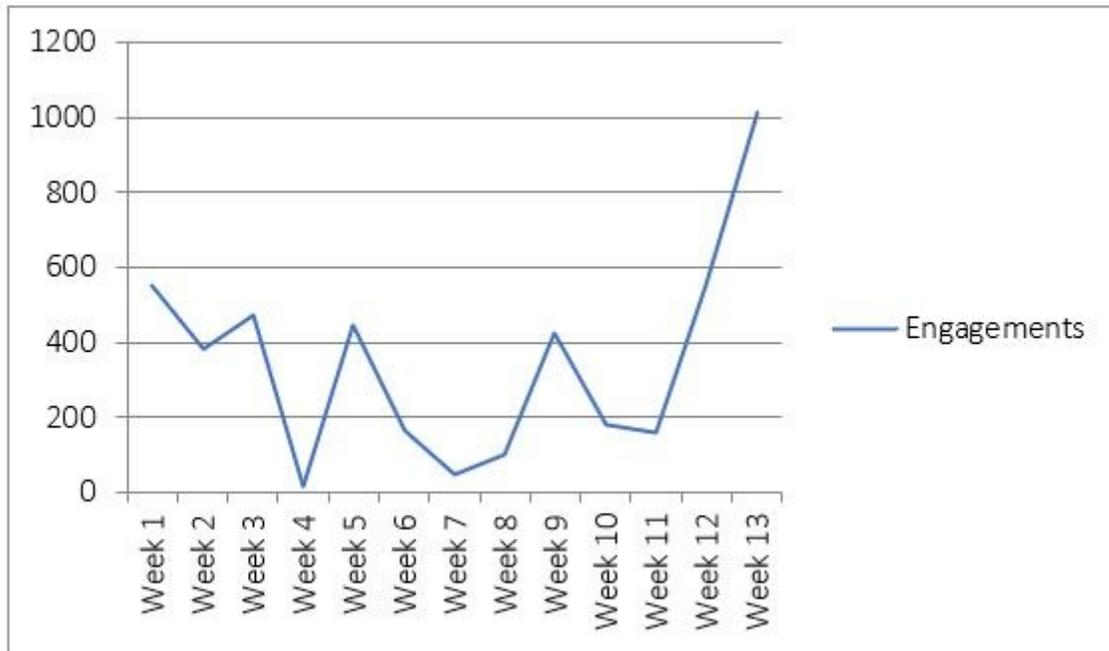


Figure 3

Comparison of Weekly Engagements during Recruitment Phase

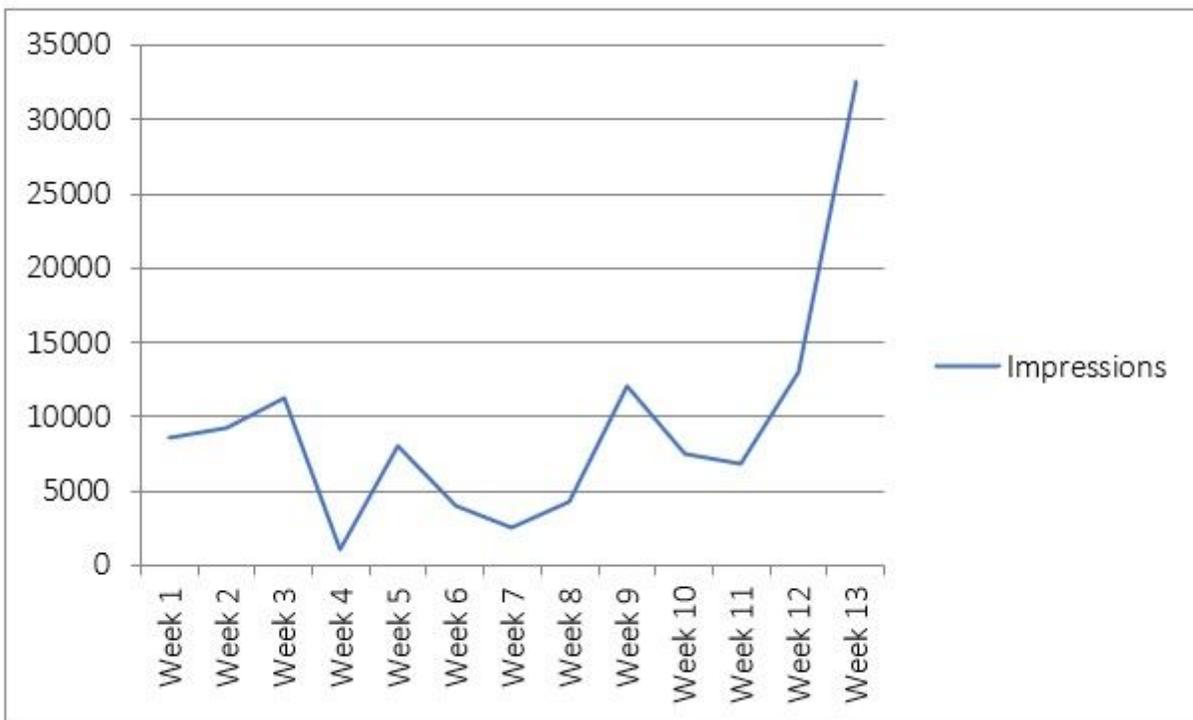


Figure 4

Comparison of Weekly Impressions during Recruitment Phase

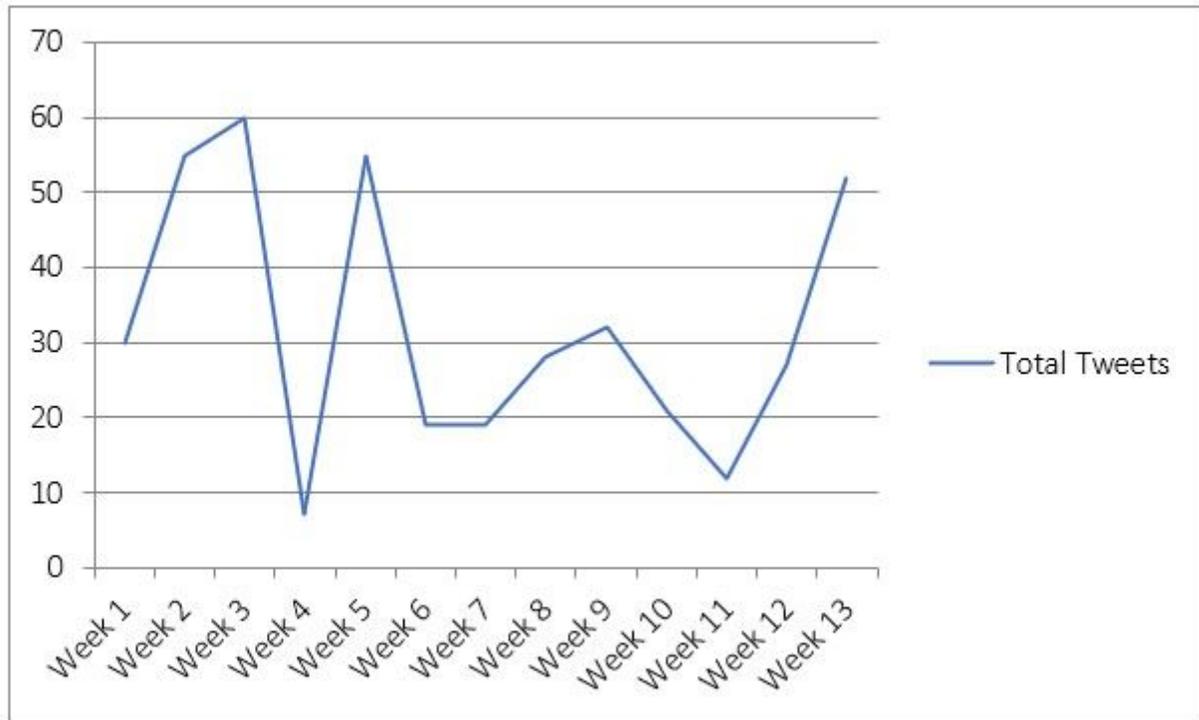


Figure 5

Comparison of total number of tweets per week during Recruitment Phase

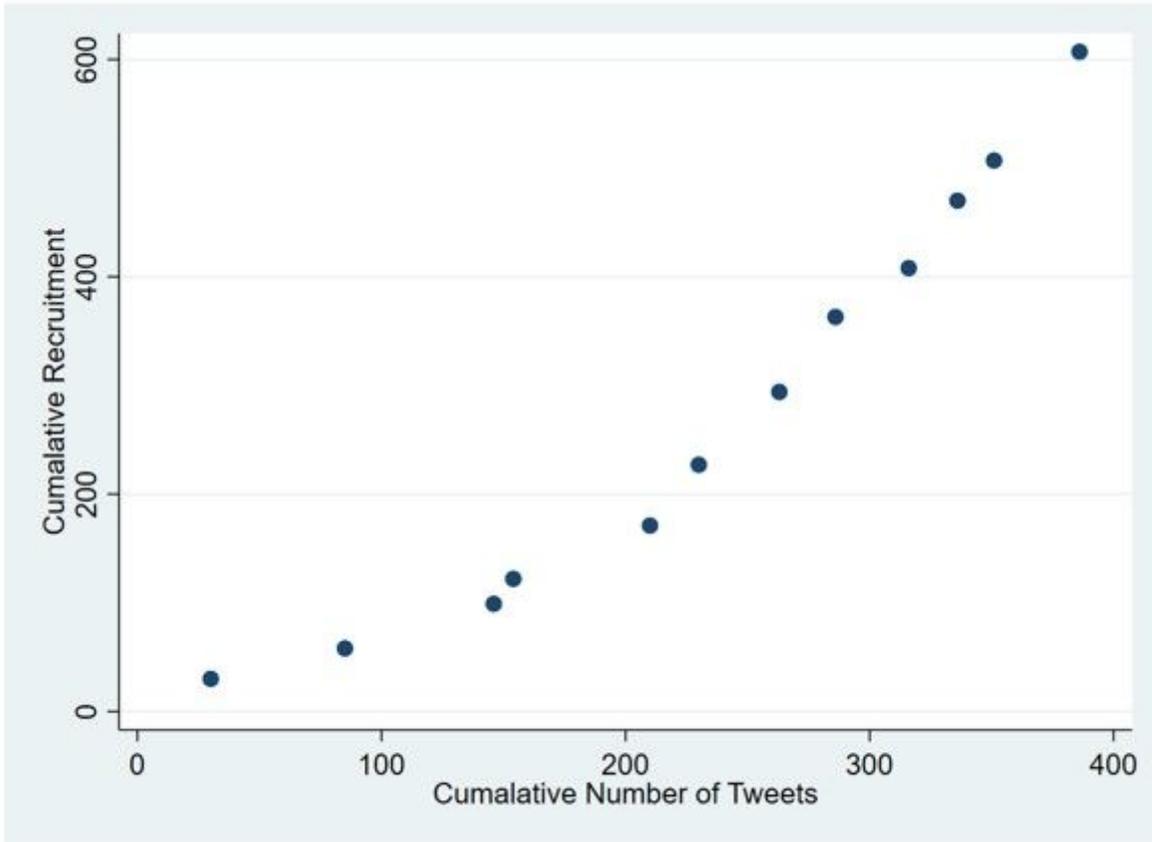


Figure 6

A Scatter plot of the Cumulative number of tweets with cumulative total recruitment ($r^2=0.94$)