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Dissemination of evidence in paediatric emergency medicine: a quantitative descriptive evaluation of a 16-week social media promotion

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ABSTRACT

Objectives TRanslating Emergency Knowledge for Kids (TREKK) and Cochrane Child Health collaborate to develop knowledge products on paediatric emergency medicine topics. Via a targeted social media promotion, we aimed to increase user interaction with the TREKK and Cochrane Child Health Twitter accounts and the uptake of TREKK Bottom Line Recommendations (BLRs) and Cochrane systematic reviews (SRs).

Design Quantitative descriptive evaluation.

Setting We undertook this study and collected data via the internet.

Participants Our target users included online healthcare providers and health consumers.

Intervention For 16 weeks, we used Twitter accounts (@TREKKca and @Cochrane_Child) and the Cochrane Child Health blog to promote 6 TREKK BLRs and 16 related Cochrane SRs. We published 1 blog post and 98 image-based tweets per week.

Primary and secondary outcome measures The primary outcome was user interaction with @TREKKca and @Cochrane_Child. Secondary outcomes were visits to TREKK's website and the Cochrane Child Health blog, clicks to and views of the TREKK BLRs, and Altmetric scores and downloads of Cochrane SRs.

Results Followers to @TREKKca and @Cochrane_Child increased by 24% and 15%, respectively. Monthly users of TREKK's website increased by 29%. Clicks to the TREKK BLRs increased by 22%. The BLRs accrued 59% more views compared with the baseline period. The 16 blog posts accrued 28% more views compared with the 8 previous months when no new posts were published. The Altmetric scores for the Cochrane SRs increased by ≥10 points each. The mean number of full text downloads for the promotion period was higher for nine and lower for seven SRs compared with the 16-week average for the previous year (mean difference (SD), +4.0 (22.0%)).

Conclusions There was increased traffic to TREKK knowledge products and Cochrane SRs during the social media promotion. Quantitative evidence supports blogging and tweeting as dissemination strategies for evidence-based knowledge products.

Strengths and limitations of this study

- We undertook a carefully planned social media promotion using multiple platforms (Twitter accounts and blogs), allowing us to reach a broad and diverse audience.
- Our study provides a useful benchmark for other groups wanting to undertake similar endeavours.
- In the absence of guidance, we based our a priori goals on historical measures of performance and selected quantitative social media metrics to measure their achievement.
- Our study does not account for the organic growth of Twitter followership and website viewership.
- We cannot ascertain to what extent our own tweets contributed to increases in Altmetric scores.

BACKGROUND

The slow or incomplete translation of evidence into clinical practice undermines healthcare professionals' (HCPs') ethical obligation to provide patients with the highest standard of care while avoiding undue risk of harm.[1] Globally and across medical specialties, evidence-to-practice gaps that lead patients to receive substandard care nevertheless remain common. A systematic review (SR) of survey data found that median adherence to evidence-based clinical practice guidelines was just 36% (IQR, 30%–56%).[2] For children, the majority of whom are cared for in non-specialty, general emergency departments,[3 4] the inadequate awareness and adoption of age-specific standards of care is especially problematic.[5–7] Targeted knowledge translation strategies may contribute to improving HCPs' awareness and application of evidence-based guidance for common acute childhood conditions.

Social media platforms are a convenient means to disseminate evidence-based health information. Among other venues, freely

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accessible platforms like Twitter and Facebook are increasingly being used by HCPs and patients to seek out information and communicate online.[8 9] Along with advances in the use of social media in healthcare settings, free open-access medical education (FOAM) has grown rapidly in the past decade.[10–12] As part of the FOAM movement, HCPs can create free and openly available educational resources which may then be rapidly disseminated through social media to colleagues and trainees.[10 11] Sharing evidence-based resources on social media platforms may also improve patient and public access to high quality health information.[13 14]

TRanslating Emergency Knowledge for Kids (TREKK, http://trekk.ca) is a Canadian knowledge mobilisation initiative driven by a network of researchers, HCPs and consumers committed to increasing the uptake of high-quality paediatric emergency medicine evidence.[15 16] TREKK creates open-access, evidence-based knowledge products to address the information and education needs of HCPs. These include: an Evidence Repository populated with expert-selected guidelines, Cochrane SRs and other key studies, and Bottom Line Recommendations (BLRs) that provide summaries of key facts and recommendations for the diagnosis and treatment of acute childhood conditions.[15 16]

TREKK collaborates with Cochrane Child Health (http://childhealth.cochrane.org/) by highlighting Cochrane evidence on paediatric emergency medicine topics within its knowledge products. Cochrane SRs bring together all available research on healthcare interventions, providing the best evidence for informed clinical decision-making. Specific to paediatric healthcare, Cochrane Child Health works with Cochrane to advocate for SRs that reflect the needs of children, facilitate SRs on child health topics, develop methods for synthesising child-relevant health research and translate Cochrane knowledge to relevant stakeholders.[17]

TREKK's Twitter account (@TREKKca) was established in December 2011. Although TREKK aims to serve Canadian HCPs and families, much of the content disseminated via its Twitter account is universally relevant. The Cochrane Child Health Twitter account (@Cochrane_Child) was established in September 2013 and aims to serve an international audience of researchers and HCPs. The Cochrane Child Health blog (https://cochranechild.wordpress.com/), established in November 2014, aims to translate child-relevant Cochrane evidence to HCPs and families. Both Twitter accounts and the blog are managed out of the Alberta Research Centre for Health Evidence (ARCHE), University of Alberta, Canada.

We used social media to disseminate and promote the uptake of TREKK knowledge products and Cochrane SRs on paediatric emergency medicine topics. ARCHE researchers and staff are involved in the administration of Cochrane Child Health and in the development and dissemination of TREKK knowledge products for HCPs, patients and families. Because Cochrane SRs provide the foundation for many of the TREKK knowledge products, including the BLRs for HCPs, we promoted the reviews and TREKK knowledge products concurrently to advocate for the use and improve the uptake of these complementary products. Via a 16-week promotion, we aimed to increase: (1) user interaction with the TREKK and Cochrane Child Health Twitter accounts, (2) visits to the TREKK website and clicks to and views of TREKK BLRs, and (3) visits to the Cochrane Child Health blog and Altmetric scores and downloads for the Cochrane SRs.

Box 1 Specific goals for the social media promotion

1. Increase followers of the TRanslating Emergency Knowledge for Kids (TREKK) and Cochrane Child Health Twitter accounts by 15%.
2. Increase site visits to the TREKK website by 10%.
3. Increase clicks to the TREKK BLRs by 10% for the first promotional week and by 5% in each additional week.
4. Increase site visits to the Cochrane Child Health blog to 6077 views.
5. Increase Altmetric (http://altmetric.com) scores for the promoted Cochrane systematic reviews by 10 points each.

METHODS

Promotion summary

We ran a 16-week social media promotion from 5 September to 25 December 2016 using blog posts and tweets. Our primary audience for the promotion was HCPs and trainees. Our secondary audience was health consumers providing care to children (parents, families). The promotion followed an a priori protocol (online supplementary file 1).

In addition to our overarching objectives, we decided on specific goals that we aimed to achieve by the end of the promotion (box 1). Our goals were based on benchmark performance indicators established during a previous social media promotion undertaken by our centre in the Fall of 2015 to promote Cochrane summaries and on historical performance of the blog. During the Fall 2015 promotion, followers to @TREKKca increased by 15% (from 452 to 521) and the Altmetric scores for the promoted Cochrane SRs increased by a mean 10 points. Between inception (2013) and 2015, 35 posts were published on the Cochrane Child Health blog. These posts received 10 109 views or 289 views per post. We therefore aimed to accrue 289 new views per blog post during the promotional period, added to the baseline views for 2016 (1453 views). In the absence of a priori performance data, we set modest goals for visits to the TREKK website and clicks to the TREKK BLRs.

Table 1 shows our weekly promotion schedule. TREKK's national needs assessment informed the topics that we selected. As part of the needs assessment, 1471 HCPs from 32 Canadian general emergency departments completed surveys on the paediatric emergency medicine topics for which information for evidence-based care would be of interest.[16 18] From the priority list of topics from the survey, we selected those where the TREKK

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Table 1 Detailed weekly social media promotion schedule

Week	TREKK BLR	Cochrane systematic review
5–11 September	Multisystem trauma	Thromboprophylaxis for trauma patients
12–18 September	Fractures	Surgical interventions for diaphyseal fractures of the radius and ulna in children
19–25 September	Multisystem trauma	Prophylactic antibiotics for penetrating abdominal trauma
26 September–2 October	Croup	Nebulised epinephrine for croup in children
3–9 October	Multisystem trauma	Selective CT versus routine thoracoabdominal CT for high-energy blunt-trauma patients
10–16 October	Fractures	Antibiotics for preventing infection in open limb fractures
17–23 October	Intussusception	Vaccines for preventing rotavirus diarrhoea: vaccines in use
24–30 October	Multisystem trauma	Non-operative versus operative treatment for blunt pancreatic trauma in children
31 October–6 November	Multisystem trauma	Antifibrinolytic drugs for acute traumatic injury
7–13 November	Gastroenteritis	Oral versus intravenous rehydration for treating dehydration due to gastroenteritis in children
14–20 November	Procedural pain	Psychological interventions for needle-related procedural pain and distress in children and adolescents
21–27 November	Gastroenteritis	Antiemetics for reducing vomiting related to acute gastroenteritis in children and adolescents
28 November–4 December	Multisystem trauma	Emergency ultrasound-based algorithms for diagnosing blunt abdominal trauma
5–11 December	Croup	Glucocorticoids for croup
12–18 December	Fractures	Interventions for treating femoral shaft fractures in children and adolescents
19–25 December	Croup	Heliox for croup in children

BLR, Bottom Line Recommendation; TREKK, TRanslating Emergency Knowledge for Kids.

Evidence Repository contained a relevant Cochrane SR (croup, fractures, gastroenteritis, intussusception, multisystem trauma and procedural pain). This allowed us to promote TREKK's knowledge products and Cochrane Child Health evidence concurrently.

Blog posts

Throughout the promotion, we published posts on the Cochrane Child Health blog. We published an introductory blog post during the week of 29 August 2016 that briefly described our promotion. Subsequently, we posted one blog post per week. Each blog post contained: the plain language summary for a Cochrane SR, published with permission from Wiley; a 'blog shot' image (image-based summary containing three key messages from the Cochrane SR) and citations and traceable links to TREKK knowledge products (Evidence Repository and BLRs); and the full text of the Cochrane SR. Online supplementary file 2 includes sample blog shot images.

The intent of our blog posts was to provide concise, informative summaries of the findings of child health Cochrane SRs that would be more appealing to our target audience. Freely accessible plain language summaries were introduced with the aim of improving the uptake of Cochrane SRs by overcoming barriers including: the length of the reviews and the use of scientific jargon, which make them impractical to read and difficult to understand for many HCPs and health consumers; and challenges related to the technical and financial access to the full text documents, which are not open access.[19] Studies in the specialties of surgery and radiology have shown that blogging about research publications is an effective means to improve the dissemination and reach of the key messages and of the publications themselves.[20 21]

Tweets

We published 98 tweets per week from four Twitter accounts: @TREKKca, @Cochrane_Child, @arche4evidence (ARCHE) and @TRIPChildHealth (Turning Research Into Practice (TRIP) database for high quality clinical research). These tweets included traceable links to the relevant TREKK knowledge products, the Cochrane SR and the Cochrane Child Health blog.

We used Buffer (https://buffer.com) to preschedule the tweets for publication at peak-traffic times for all Twitter accounts. We included images in each tweet. These included the aforementioned blog shots as well as images modified from files supplied by Cochrane UK, ShutterStock, the TREKK knowledge products development team and other websites containing public domain images (eg, Wikimedia Commons, thenounproject.com). We also used the Pablo image editor in Buffer (https://

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pablo.buffer.com/) to create images to promote the Cochrane SRs. During weeks when sensitive topics were covered (eg, multisystem trauma), we used general emergency medicine images (eg, ambulances, medical equipment) as to inform our audience without posing undue discomfort. Online supplementary file 3 shows samples of our image-based tweets.

Audience engagement

During the week of 29 August 2016, we emailed the corresponding authors and the Cochrane Review Groups (who manage the editorial processes associated with the production and publication of Cochrane SRs) for each of the 16 Cochrane SRs that we planned to promote. We informed them of our intention to promote their review via social media, provided the dates of the promotion and encouraged them to check the Cochrane Child Health Twitter account and retweet our messages. We invited the corresponding authors to provide key messages for the blog. We also contacted TREKK content advisers and shared our intention to promote the TREKK knowledge products and Cochrane SRs. We invited them to retweet our messages and provide a quote as to the value of the selected Cochrane SR and of their BLR for HCPs.

During the promotion, members of our team (RF, EH) monitored the Twitter accounts and replied to comments about the promoted content. Through our replies, we aimed to promote further engagement with TREKK and Cochrane Child Health. We did not dispense clinical information but committed to sharing the feedback with our team.

Patient involvement

Although we did not involve patients in the development of the research questions or choice of outcome measures, health consumers were one of the target audiences for our promotion. We incorporated features into the promotion that would enhance its appeal to health consumers, including the plain language summaries and blog shots. We disseminated the findings of this study to our followers, including health consumers, via image-based tweets from the four Twitter accounts.

Data collection

Throughout the promotion, we collected indicators of engagement with our Twitter accounts, the uptake of TREKK BLRs and Cochrane SRs, and visits to the TREKK website and Cochrane Child Health blog. We stored the data in a Microsoft Office Excel (V.2016, Microsoft, Redmond, Washington, USA) workbook.

On 15 August 2016, we recorded the baseline Twitter followers for the @Cochrane_Child and @TREKKca accounts. One week following the completion of the promotion, we again recorded the total followers at each account. To measure user interaction with our accounts, each week during the promotion we collected metrics from the Twitter activity dashboard. These included the number of retweets (times a user retweeted our tweet), favourites (times a user favourited our tweet), impressions (times a user followed our accounts directly from a tweet) and engagements (times a user interacted with our tweet, that is, clicked anywhere on the tweet, including retweets, replies, follows, likes, links, cards, hashtags, embedded media, username, profile photo or tweet expansion).[22]

At baseline (average for the months of July and August 2016) and following the promotion (25 December 2016), we collected the number of site visits to http://trekk.ca, measured by the number of sessions, page views and users via Google Analytics (http://www.google.com/analytics/) reports. We collected the number of clicks to the TREKK BLRs using the @arche4evidence bit.ly (https://bitly.com) account. We collected click count data at baseline (15 August 2016) and 30 days after the links to the BLRs were created (beginning on 5 October 2016 and weekly until 1 February 2017). We also collected the number of BLR document views at baseline (for the 16-week period before the promotion) and during the promotion period via reports produced by http://trekk.ca.

We collected the number of site visits to the Cochrane Child Health blog for the 3 years prior to the promotion, at baseline (year-to-date on 15 August 2016) and following the promotion (3 January 2017) via information provided by WordPress (http://wordpress.com). We recorded Altmetric scores provided by http://altmetric.com for each of the SRs at baseline (15 August 2016) and at the end of the promotion (25 December 2016). Altmetrics are non-traditional metrics that complement traditional citation impact metrics like the Impact Factor.[23] The score provided by altmetric.com is a composite measure of an article's dissemination (ie, readership), whereby more popular (or 'buzzworthy') articles are scored more highly.[24] We also collected the total tweets for each of the Cochrane SRs that we promoted via the Altmetric data provided by the Cochrane Library. Following the promotion, Wiley (the publisher for Cochrane systematic reviews) provided full text download data for the period of September 2015 to January 2017 for each of the SRs that we promoted.

Data analysis

We calculated descriptive statistics in Excel. We calculated the increase in Twitter followers by subtracting the baseline followers from the total followers at the end of the promotion for each account and calculated the per cent increase. We calculated the total and mean (SD) retweets, favourites, impressions and engagements per week, per topic and overall for each account. We calculated the total users, sessions and page views for the TREKK website for each promotion month and the monthly average (SD). We calculated the total clicks to and views of the BLRs and the per cent increase in clicks and views from baseline, by topic and overall. We calculated the per cent increase in visits to the Cochrane Child Health blog during the campaign compared with baseline. We calculated the point increase and per cent increase in Altmetric scores and per cent change in the number of full text downloads

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for each Cochrane SR compared with baseline. We calculated the contribution of our own tweets to the total tweets for each Cochrane SR during the promotion. We compared all metrics to our a priori goals to determine which we had achieved.

RESULTS

User interactions with @TREKKca and @Cochrane_Child

At baseline, the @TREKKca and @Cochrane_Child Twitter accounts had 633 and 1934 followers, respectively. During the promotion, the @TREKKca account gained 149 followers (23.5% increase) to a total 782 followers. The @Cochrane_Child account gained 283 followers (14.6% increase) to a total 2217 followers. We met our goal of increasing followers to each account by 15%.

Table 2 shows user interactions with each Twitter account, stratified by topic. Detailed weekly interaction data are available in online supplementary file 4. During the campaign, the @TREKKca account received a mean (SD) of 36 (13) retweets, 28 (8) favourites, 12005 (2843) impressions and 261 (88) engagements per week. The @Cochrane_Child account received a mean (SD) of 56 (35) retweets, 37 (20) favourites, 17073 (4560) impressions and 382 (209) engagements per week.

TREKK website and knowledge products

Table 3 shows the monthly site visits to the TREKK website. During the months of July and August 2016 (baseline), the TREKK website logged a mean of 893 users, 1378 sessions and 4642 page views per month. During the promotion, the website logged a total of 4608 users, 6955 sessions and 19090 page views. This equated to a mean (SD) of 1152 (151) users, 1739 (217) sessions and 4773 (688) page views per month. On average, there were 29% more users, 26% more sessions and 2.8% more page views per month during the promotion than at baseline. We surpassed our goal of increasing site visits to the website by 10% based on the number of users and sessions, but not on number of page views.

Table 4 shows the clicks to and views of the TREKK BLRs. At baseline (15 August 2016), there were 1429 clicks to the BLRs. During the promotion, the total number of clicks increased to 1746 (317 click increase, 22.2%). For the 16-week period before the promotion (baseline), the BLRs were viewed 574 times. During the promotion, the BLRs accrued 915 views (314 (59.4%) more than baseline). There were more views during the promotion than during the baseline period for all of the BLRs (range, 23.3%–116.0% more). We achieved our goal of increasing the clicks to all of the BLRs by 10% for the first promotional week and 5% for each additional week promoted, except for those on croup and multisystem trauma.

Cochrane Child Health blog and Cochrane systematic reviews

In the 3 years before the campaign (2013–2015), there were a total of 38 posts to the Cochrane Child Health blog and 8625 site views (108, 1192 and 7325 views,

Table 2 User interaction with the @TREKKca and @Cochrane_Child Twitter accounts, stratified by topic

Topic	Weeks promoted	@TREKKca, N total (N/week)*				@Cochrane_Child, N total (N/week)*			
		Retweets	Favourites	Impressions	Engagements	Retweets	Favourites	Impressions	Engagements
Croup	3	146 (49)	96 (32)	42805 (14268)	916 (305)	230 (77)	149 (50)	60230 (20077)	1571 (524)
Fractures	3	87 (29)	66 (22)	33260 (11087)	659 (220)	125 (42)	94 (31)	52172 (17391)	986 (329)
Gastroenteritis	2	89 (45)	66 (33)	25938 (12969)	594 (297)	185 (93)	109 (55)	42472 (21236)	1335 (668)
Intussusception	1	26 (26)	24 (24)	11821 (11821)	183 (183)	89 (89)	43 (43)	19181 (19181)	408 (408)
Multisystem Trauma	6	177 (30)	152 (25)	61020 (10170)	1408 (235)	156 (26)	124 (21)	75362 (12560)	1182 (197)
Procedural pain	1	44 (44)	42 (42)	17230 (17230)	420 (420)	109 (109)	74 (74)	23756 (23756)	622 (622)
Total	16	569 (36)	446 (28)	192074 (12005)	4180 (261)	894 (56)	593 (37)	273173 (17073)	6104 (382)

*We based the weekly interactions on the total number of weeks that we promoted the topic.

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Table 3 Overall monthly site visits to the TREKK website (trekk.ca)*

Time point	Users†	Sessions	Page views
Baseline‡	893	1378	4642
September 2016	1004	1512	4082
October 2016	1133	1736§	4795
November 2016	1362	2031§	5707¶
December 2016	1109	1676§	4506
Total	4608	6955	19090
Mean±SD	1152±151	1739±217	4773±688

*We aimed to increase the total monthly users, sessions and page views for the website by 10%.
†We exceeded our goal of 928 users per month (total, 3928 users) each month during the promotion.
‡Average values for the months of July and August 2016.
§Months during which we exceeded our goal of 1516 sessions per month (total, 6065 sessions).
¶Month during which we exceeded our goal of 5106 page views per month (total, 20424 page views).
TREKK, TRanslating Emergency Knowledge for Kids.

respectively). From 1 January to 15 August 2016, there were no new posts and 1453 site views. During the campaign, we published 17 new blog posts. The blog accrued 1856 new views, to a total 3309 views for the year 2016. We did not achieve our goal of increasing the number of views to the blog to 6077 (289 views for each new post, based on performance from 2013 to 2015).

Table 5 shows the Altmetric scores and downloads for the Cochrane SRs. The Altmetric scores for all of the promoted Cochrane SRs increased during the campaign. The mean (SD) point increase was 16.7 (5.1). We achieved our goal of increasing the Altmetric scores for the Cochrane SRs by 10 points each. Data from altmetric.com show that during the campaign, our own tweets comprised 57.0% of all tweets related to the Cochrane SRs that we promoted (online supplementary file 5). Our own tweets comprised a larger proportion of the total tweets for the reviews on multisystem trauma (58%–77%), fractures (59%–68%) and intussusception (61%) compared with those on croup (44%–55%), procedural pain (42%) and gastroenteritis (43%–46%).

Compared with the mean number of downloads during a 16-week period for the year before the promotion (baseline), the total downloads for the Cochrane SRs did not consistently increase during the promotion and decreased for 7 of 16 (44%) reviews. Compared with the baseline download rate, there was a mean (SD) 4.0 (22.0)% increase in the number of times the promoted Cochrane SRs were downloaded.

DISCUSSION

Using Twitter and blogs, we aimed to disseminate and promote the uptake of TREKK knowledge products and Cochrane SRs on paediatric emergency medicine topics. Although our study design precludes inferring causation, during the campaign period we successfully increased the number of followers to the TREKK and Cochrane Child Health Twitter accounts by a respective 24% and 15%. We also observed increased traffic to the TREKK website and a 22% increase in clicks to and 59% increase in views of the TREKK BLRs. Although full text downloads of the Cochrane SRs did not universally increase, the Altmetric scores increased by at least 10 points for each review. Despite not meeting our target views for the Cochrane Child Health blog, monthly traffic to the site was 1.5 times greater during the promotion compared with the previous 8 months during which we had published no new posts.

Common barriers to the adherence to evidence-based guidelines in medical practice include inadequate

Table 4 Clicks to and document views of the TREKK Bottom Line Recommendations, stratified by topic

BLR topic	Weeks promoted	Clicks,* N total				Document views,† N total		
		Baseline	Goal‡	Total clicks (N/week)	Per cent increase	Baseline	Total views (N/week)	Per cent increase
Croup	3	438	526	489 (163)	11.6%	155	265 (88)	71.0%
Fractures	3	386	463	478 (159)	23.8%	176	217 (72)	23.3%
Gastroenteritis	2	298	343	386 (193)	29.5%	106	229 (115)	116.0%
Intussusception	1	150	165	186 (186)	24.0%	63	90 (90)	42.9%
Multisystem trauma	6	157	212	207 (35)	31.8%	74	114 (19)	54.1%
Total§	15	1429	1709	1746 (116)	22.2%	574	915 (61)	59.4%

*Clicks on bit.ly links. We collected baseline data on 15 August 2016.
†Based on TREKK.ca analytics. We collected baseline data for the period 16 weeks before the promotion.
‡We aimed to increase the number of clicks to the TREKK BLRs by 10% for the first week that we promoted it and 5% for each additional week (ie, 20% for 3 weeks of promotion).
§The Bottom Line Recommendation for procedural pain was published in October 2016, so we had no baseline data for this topic and did not include it in the calculation of the totals. We promoted the Bottom Line Recommendation for procedural pain for 1 week and it received 105 views over the promotion period.
BLR, Bottom Line Recommendation; TREKK, TRanslating Emergency Knowledge for Kids.

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Table 5 Altmetric scores and full text downloads for the promoted Cochrane systematic reviews

		Altmetric score, points				Full text downloads, N total		
Week	Cochrane systematic review	Baseline*	Goal†	Final	Point increase (%)	Baseline‡	Final	Per cent difference
1	Thromboprophylaxis for trauma patients	6	16	21	15 (250.0)	426	385	–9.5%
2	Surgical interventions for diaphyseal fractures of the radius and ulna in children	0	10	13	13 (130.0)	79	82	+4.1%
3	Prophylactic antibiotics for penetrating abdominal trauma	14	24	25	11 (78.6)	136	119	–12.7%
4	Nebulised epinephrine for croup in children	33	43	53	20 (60.6)	612	595	–2.8%
5	Selective CT versus routine thoracoabdominal CT for high-energy blunt-trauma patients	0	10	10	10 (100.0)	128	149	+16.7%
6	Antibiotics for preventing infection in open limb fractures	4	14	18	14 (350.0)	263	252	–4.1%
7	Vaccines for preventing rotavirus diarrhoea: vaccines in use	36	46	54	18 (50.0)	406	386	–5.0%
8	Non-operative versus operative treatment for blunt pancreatic trauma in children	2	12	16	14 (700.0)	82	93	+14.1%
9	Antifibrinolytic drugs for acute traumatic injury	49	59	63	14 (28.6)	596	484	–18.8%
10	Oral versus intravenous rehydration for treating dehydration due to gastroenteritis in children	14	24	36	22 (157.1)	345	492	+42.6%
11§	Psychological interventions for needle-related procedural pain and distress in children and adolescents	–	–	109	–	910	999	+9.8%
12	Antiemetics for reducing vomiting related to acute gastroenteritis in children and adolescents	42	52	62	20 (47.6)	443	685	+54.6%
13	Emergency ultrasound-based algorithms for diagnosing blunt abdominal trauma	3	13	23	20 (666.7)	557	350	–37.2%
14	Glucocorticoids for croup	16	26	46	30 (187.5)	777	795	+2.3%
15	Interventions for treating femoral shaft fractures in children and adolescents	4	14	17	13 (325.0)	222	245	+10.4%
16	Heliox for croup in children	16	26	32	16 (100.0)	250	251	+0.2%
Mean±SD		–	–	–	16.7±5.1 (215.4±214.0)	–	–	+4.0 (22.0)%

*Baseline altmetric.com scores were collected for each Cochrane systematic review on 15 August 2016.
†We aimed to increase the altmetric.com scores for each Cochrane systematic review that we promoted by 10 points.
‡We calculated the average weekly downloads from the previous year (52 weeks) and multiplied this by 16 to obtain the average number of downloads for a 16-week period in the year prior to the promotion.
§We did not originally plan to promote this Cochrane systematic review, so we did not collect the baseline altmetric.com score. We replaced the systematic review that we originally planned to promote following a request from the knowledge products development team.

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knowledge of the guideline, attitudes (eg, lack of motivation or self-efficacy) and behavioural factors (eg, patient preferences, organisational constraints).[25] With respect to knowledge, especially for conditions where new evidence is accumulating quickly, keeping up with the latest guidance can be overwhelming or impossible.[10 26] Moreover, as not all published research is freely available,[27] the latest evidence may not be accessible by all HCPs. The rapid and continued growth of FOAM represents one important step towards reducing evidence-to-practice gaps in medicine by supporting free access to a dynamic collection of tools and resources for continuing education.[28] Just as HCPs are interested in keeping informed, author groups and organisations are seeking practical means to expand the visibility and uptake of their research and knowledge products. Our data suggest that targeted social media promotions can successfully drive traffic towards websites and products that support evidence-based practices.

Knowledge of the facets of effective social media messages will help to guide the planning and implementation of successful promotions. As many investigations of text-only tweets already exist,[20 29–31] our study is novel in that we committed to including custom images that supported the messages in all of our tweets. Ibrahim *et al*[32] designed a prospective, case-control crossover study whereby academic research articles were promoted using text-based tweets as well as tweets containing visual abstracts.[32] Compared with the text-based tweets, those that contained visual abstracts were retweeted 8.4 times more often (p<0.001) and received 7.7 times as many impressions (p<0.001).[32] Even when images are unrelated to the posted content, their simple presence can entice users to read the accompanying tweet.[29] Nevertheless, real-life prospective evaluations comparing tweets of various content (eg, text, images, videos) are few, so how to best structure a tweet aimed at disseminating knowledge products is not well known. Algorithms are being developed with the goal of predicting the popularity and lifespan of tweets.[33–35] These may provide some insight into the components of effective promotional messages.

Despite marked increases in Twitter followers and in views of our knowledge products, full text downloads of the Cochrane SRs were comparable to baseline overall and were less than baseline for some reviews. Because we did not have access to page view data, we relied on full text downloads to estimate the uptake (ie, number of reads) of the reviews. However, Cochrane SRs are long and their statistical findings can be difficult to understand.[36] Moreover, HCPs typically spend only 2 min pursuing answers to healthcare questions,[37] and when reading published research, many do not read the full text and some read only the abstract.[38] The addition of Summary of Findings tables (which summarise the findings of the reviews in a user-friendly format) to Cochrane SRs reduced the time to answer clinical questions from 1.5–4.0 min to 1.3–2.1 min and increased HCPs' and researchers' understanding of the key findings.[36] It is plausible in our study that our followers accessed only the abstract and Summary of Findings tables and did not download the full text.[39] Thoma *et al* (2017) reported similar results for a social media promotion (tweets and podcasts) of research published in the Canadian Journal of Emergency Medicine, whereby Altmetric scores and abstract readership, but not full text readership, significantly increased.[39] Being concise and easy to understand, our knowledge products may also have been more appealing to busy HCPs compared with the Cochrane SRs that informed them.

Despite the growing popularity of FOAM, one of the most common criticisms is that of quality control.[14 28] To the same degree that social media allow evidence-based materials to be widely and rapidly disseminated, misinformed messages and fallacious materials can also propagate quickly. The onus is mainly on the knowledge users to decipher the quality of online health information. A number of scoring tools have been developed to measure the quality of internet-based resources for patients and clinicians,[40 41] but their use in practice is uncommon.[42] More often, individuals use visual cues to rapidly appraise the credibility of online sources, including reputation, endorsement, consistency, self-confirmation, expectancy violation and persuasive intent.[42 43] Visual cues, however, are not always reliable indicators of credibility (eg, 'unpopular' tweets can contain credible content).[42] In our promotion, we included our logos (TREKK and Cochrane) on the tweeted images, cited full text materials in our blog posts[28] and tweeted from reputable accounts to establish credibility. It would be interesting in future studies to investigate how these visual cues of credibility impact the uptake of knowledge products disseminated on social media.

Implications for research and practice

A challenge for organisations who want to undertake evaluations of social media for knowledge dissemination in health is that, to our knowledge, no guidelines exist on: (1) how to set goals, (2) what is reasonable to achieve, (3) which social media metrics can or should be tracked and (4) what should be considered 'successful'. In the absence of guidance, we developed specific goals based on historical measures of performance and decided on quantitative social media metrics to evaluate their achievement. As researchers whose expertise does not lie in media communications, we overlooked alternative measures of performance, for example, Symplur analytics to measure the reach of a promotion-specific hashtag, which may have provided a better indication of the promotion's disseminative potential (as recommended by an expert peer reviewer). Because many organisations do not have specialised personnel devoted to managing social media profiles, practical guidance for undertaking effective and efficient evaluations of their promotions is needed.

Since we could not ascertain the contribution of our own social media activity to the increases in Altmetric scores, we calculated how many of the total tweets for each review during the promotional period were our

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own (online supplementary file 5). These data, along with our Twitter analytics for the @TREKKca and @Cochrane_Child accounts, made it clear that our promotion performed better for some topics compared with others. For example, our own tweets made up far more of the total tweeting activity for the reviews on topics related to multisystem trauma, fractures and intussusception compared with those on croup, procedural pain and gastroenteritis. Our Twitter analytics also reflected greater user interaction with our tweets for the latter three topics. It is possible that reviews on croup, procedural pain and gastroenteritis are more appealing to our followers. Reviews on these relatively common paediatric conditions may also appeal to a broader audience (eg, parents, family medicine physicians). Our findings demonstrate the value in knowing one's followers and tailoring messages to their interests when planning a social media promotion.

The significance of communities of practice for knowledge sharing and professional development in social media has only begun to be investigated. Traditionally, communities of practice develop around the interests of their members and provide a vehicle to share expertise in an area of practice.[44 45] Communities of practice can improve patient care by fostering engagement, collaboration, learning, knowledge and reflection.[46] Social media provide the opportunity to more easily and efficiently build networks of HCPs who share a common interest and desire to share their thoughts and experiences.[45] Developing new and leveraging existing networks may therefore be a promising approach to using social media to improve the uptake of knowledge products and inspire informed conversations and changes to practice.[45] Guidance for how to best develop and build online networks would be helpful to organisations wishing to move evidence into practice via the wide dissemination of knowledge tools.

An analysis of the #FOAMed online community of practice showed that it was organised around highly influential members who were responsible for 73% of all tweets.[47] On Twitter, these opinion leaders account for a small proportion of all users[48] but they can impact conversations substantially more than ordinary users.[48 49] Opinion leaders are likeable, trustworthy, educationally influential[48 49] and highly credible[50] and have greater social participation compared with their followers.[51] Users may become opinion leaders because they have a large cohort of followers, their followers themselves are highly influential or they have a unique group of followers to help disseminate information.[52] In the context of our study, no member of our research team is considered an influencer of emergency medicine physicians.[52] Garnering the attention of opinion leaders, however, could be a promising strategy to optimising the dissemination and uptake of social media messages. Conversely, in the hands of highly influential users, it is also possible for superficial or inaccurate messages to be rapidly and widely disseminated.[52] Empirical evaluations of the behaviour of highly influential Twitter users may inform approaches to optimise the uptake of shared content.

CONCLUSION

There was increased traffic to TREKK knowledge products and Cochrane SRs during our social media promotion. Social media represent an appealing means to disseminating and promoting health knowledge products, thanks to the potential for a broad reach. Nevertheless, it is not entirely clear how social media messages should be structured to optimise their uptake among broad audiences of followers. It is important that organisations measure and report on the impact of their social media efforts. The findings of well-planned evaluations will provide empiric evidence of their effectiveness and inform best practices for designing impactful social media messages.

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Contributors RF developed the protocol for the study, and AG, KS, SDS and LH provided input. AG, RF and KS developed the Tweets and blog posts. RF and KS collected the data. AG, RF and KS analysed the data and AG drafted the manuscript. RF, KS, SDS and LH critically revised the manuscript draft for important intellectual content. All authors agreed to be accountable for all aspects of the work and approved of the final version as submitted to the journal.

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