

Sport Concussion Management Using Facebook: A Feasibility Study of an Innovative Adjunct “iCon”

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Context: Sport concussion is currently the focus of much international attention. Innovative methods to assist athletic trainers in facilitating management after this injury need to be investigated.

Objective: To investigate the feasibility of using a Facebook concussion-management program termed *iCon* (interactive concussion management) to facilitate the safe return to play (RTP) of young persons after sport concussion.

Design: Observational study.

Setting: Facebook group containing interactive elements, with moderation and support from trained health care professionals.

Patients or Other Participants: Eleven participants (n = 9 men, n = 2 women; range, 18 to 28 years old) completed the study.

Data Collection and Analysis: The study was conducted over a 3-month period, with participant questionnaires administered preintervention and postintervention. The primary focus

was on the qualitative experiences of the participants and the effect of *iCon* on their RTP. Usage data were also collected.

Results: At the completion of the study, all participants (100%) stated that they would recommend an intervention such as *iCon* to others. Their supporting quotes all indicated that *iCon* has the potential to improve the management of concussion among this cohort. Most participants (n = 9, 82%) stated they were better informed with regard to their RTP due to participating in *iCon*.

Conclusions: This interactive adjunct to traditional concussion management was appreciated among this participant group, which indicates the feasibility of a future, larger study of *iCon*. Athletic trainers should consider the role that multimedia technologies may play in assisting with the management of sport concussion.

Key Words: Internet, social media, program evaluation

Key Points

- The use of a Facebook adjunct to traditional concussion management called *iCon* (interactive concussion management) was well-received by the participants in this study.
- Decisions about the participants' return to play were influenced in a positive manner by *iCon*.
- Social-media innovations constitute a potentially valuable means of supporting an individual during postconcussion recovery.

Sport concussion is currently considered a “hot topic” in both the mainstream media^{1,2} and the scholarly literature.^{3,4} The effects of concussion have dominated the dialogue in many professional sports,^{5–7} and its implications have been recognized at the amateur level.⁸ The cost of sport concussion can be defined in financial⁹ and societal terms¹⁰ as well as its effects on wellbeing (health).¹¹ Due to these consequences, much focus has been placed on technologies that can aid in the detection of concussion^{12,13}; however, less attention has been placed on facilitating and managing recovery after concussion. Given the significance of sport concussion as a leading public health concern,¹⁴ it is prudent to explore a wide array of approaches to facilitate the recovery of individuals after a sport concussion and to assist athletic trainers in this process.¹⁵

An area of health care that has not been fully explored with respect to sport concussion is *eHealth*, which is

defined as “health services and information delivered or enhanced through the Internet and related technologies.”¹⁶ Whereas early *eHealth* interventions were centered on simple communication methods such as text messaging,¹⁷ the sophisticated nature of the Internet has led to more nuanced approaches to online health interventions.¹⁸ The advent and widespread use of social media has been a factor in this process.¹⁹ Social media (including platforms such as Facebook, Twitter, and YouTube) are now ubiquitous throughout society and are widely used for a variety of everyday purposes, including as a popular adjunct to health care.^{20–22}

The use of evolving technologies to assist in the management of sport concussion has been described in the clinical literature,^{23,24} and there is also a growing awareness of the role that technology can play in the detection of sport concussion.^{25,26} Multiple smartphone

applications (apps) are tailored for sport concussion.^{27,28} In a systematic review, Lee et al²⁵ demonstrated that the currently available concussion-related apps are targeted at a wide range of consumers (including medical professionals, the general public, and the parents of young sportspersons). The content of the concussion information in these apps varied in its quality and consistency; many concussion-related apps failed to provide consumers with information that adhered to best-practice guidelines.²⁵

Researchers have described the use of Web sites and social media for the dissemination of concussion-related information. In an earlier study, Ahmed et al²⁹ evaluated the content of concussion-related Facebook groups and used the term *iSupport* (interactive support) to describe the process by which persons with concussions were communicating and seeking support. The same authors also analyzed concussion-related Web sites and found that the quality of online information available for consumers was inconsistent,³⁰ although further investigations^{31,32} have been conducted into the content of concussion-related information on Twitter and YouTube. Facebook support groups have been shown to be beneficial for a range of conditions, including breast cancer³³ and diabetes,³⁴ and for the parents of preterm infants.³⁵ The use of innovative strategies and technologies to assist in the diagnosis and management of concussion has been recognized and recommended in the Concussion in Sport (CIS) consensus statement³ and the National Athletic Trainers' Association position statement.¹⁵ Furthermore, social media have been cited as a means of facilitating concussion education.³⁶

Given the widespread use of social media (in particular, Facebook) and the high prevalence of sport concussion in the younger population, an exploration of the use of Facebook to assist individuals in managing the recovery process was indicated. Therefore, the aim of our study was to establish the feasibility of a Facebook concussion-management strategy termed *iCon* (interactive concussion management) to facilitate the management and safe return to play (RTP) of young persons with sports concussion. The successful implementation of a concussion-management adjunct such as *iCon* could lead to a range of benefits, including providing the patient with interactive and real-time feedback, giving athletic trainers an additional tool to help manage their players' RTP and potentially easing some of the burden on the patient's medical provider.

METHODS

Study Design

This qualitative study was designed as a single-group, observational feasibility study, with the focus on gauging the suitability of the Facebook management strategy for a potential larger study.³⁷ Program evaluation methods³⁸ were adopted to help assess its feasibility and provide a comprehensive approach that extended beyond outcome measures. By using this approach, we anticipated that the multiple facets of the study (including participant satisfaction and the dynamics within the intervention) could be evaluated. Data were collected before, during, and after the introduction of *iCon*. The study began when the first participant was entered into the group and ended 90 days after this point.

Ethical Approval

Ethical approval was obtained from the University of Otago Human Ethics Committee, Dunedin, New Zealand, before commencing this study.

Design of iCon

Authors of previous related studies^{29,30} indicated that online resources were a potentially valuable means of assisting an individual with a concussion. Before the creation of *iCon*, Ahmed³⁹ consulted with different key stakeholder groups: namely, young persons with sport concussions and the primary care physicians responsible for their care.⁴⁰ These primary stakeholders were supportive of Facebook being used in this manner. An explorative study was also undertaken of the ethical concerns related to the use of Facebook to deliver a concussion intervention,⁴¹ and these concerns helped to shape the creation of the *iCon* content and operation.

iCon was designed to augment the face-to-face interactions individuals had with their primary care physicians. A Facebook group that was designed specifically for this trial, *iCon* contained the following key features:

- Best-practice concussion information at the time of the study
- The ability to obtain real-time feedback from experienced medical personnel
- A vehicle for peer support via interaction in *iCon* with other individuals who had sustained a concussion

For the purposes of privacy and confidentiality, *iCon* was established as a "secret" Facebook group. This ensured that only the participants in *iCon* would be able to see the information posted within the group and that individuals external to *iCon* would not be able to view its contents. Given that elite sportspersons typically have access to high-level medical services and have different needs from those of recreational athletes, *iCon* was targeted as a community-based intervention for nonprofessional athletes.

***iCon* Content.** All advice and recommendations in *iCon* were based on the most up-to-date concussion information at the time the study was conducted, namely, the 2008 international consensus statement.⁴² Since this study was completed, these guidelines have been superseded by the 2012 international consensus statement³; however, the main premise relating to concussion management is unchanged. The key content features of *iCon* are outlined in Table 1.

***iCon* Staff.** Two individuals were responsible for providing input during *iCon*: the *iCon* facilitator (iCF) and the *iCon* physician. The iCF (O.H.A.) was responsible for the day-to-day management of *iCon*, posted information relating to concussion, and answered any questions raised by the participants. The iCF was a sports physical therapist trained at the postgraduate level, who had 9 years of clinical experience (including 5 years of working in elite sports) at the time of the study. The iCF recorded details relating to participant interactions during the pilot study and monitored *iCon* on a daily basis (minimum 3 times per day, 7 days per week, for the 90 days of the trial). A Facebook profile was created for the iCF specifically and solely for the purposes of this study. This profile contained information relating to his professional and academic credentials but none relating to his personal life, hobbies,

Table 1. Key Content Features Incorporated Into iCon

Included Content	Justification for Content
Important concussion information	Summarizing the key points of the 2008 consensus statement ⁴² in iCon allowed participants to refer back to this information as needed. Key information regarding signs and symptoms, rest, return to play, and seeking medical attention was included in this section.
Web sites	As well as providing written information in iCon, links were also provided to key external Web sites. Prior work ⁴³ has highlighted the inconsistent accuracy of concussion information online, and it followed from this that only those Web sites that contained accurate information were included.
Videos	In addition to the static concussion information present, a video section was also developed. This included YouTube videos and podcasts, all of which contained concussion information adhering to the 2008 consensus statement. ⁴²
Daily posts	In order to facilitate interaction and group dynamics and enhance the benefit to the participants, the iCon facilitator posted daily on the group wall. These posts were varied in nature and included information about concussion, links to concussion stories that had been published online in mainstream media, YouTube clips related to concussion, and links to Web sites containing concussion information. Each link was verified to ensure that the information was sufficiently in keeping with best practices to be included in iCon.
Polls	To stimulate participation and discussion within iCon, the "Ask Question" function was used several times during the trial. By using this function, a question could be posed to participants that would allow them to choose from the predefined answers or respond with an answer of their own if necessary.

or interests. Any medical questions that were outside the iCF's scope of practice were referred to the iCon physician. The iCon physician served as a consultant. Queries were forwarded to the iCon physician by e-mail, and his replies were posted on iCon by the iCF. The iCon physician was a primary care clinician at a university health center, had significant experience working with sports teams and young persons' health, and had frequently encountered sportspersons presenting with concussion as part of his clinical caseload.

Participants

The target population was males and females between the ages of 16 and 30 years who had sustained a recent concussion⁴² while playing a recreational or competitive sport. Participants included those with a medical diagnosis or self-reported symptoms of concussion after an injury mechanism, as defined in the 2008 consensus statement.⁴² Individuals were not required to have a medically confirmed diagnosis of concussion before registering for the study, nor were they required to be cleared before their

RTP (although this was strongly encouraged through their participation in iCon). If they had not already done so, all participants in the study were advised to seek medical review after their concussion. Individuals could not enroll in the study fewer than 3 days postinjury in order to provide them with cognitive rest after their injury, and they had to consent to participation. To participate in iCon, all individuals had to either have a Facebook account or be willing to create one for the purposes of the study and had to have regular access to the Internet for the duration of their participation.

Sport concussions were the sole focus of this study, and individuals with a concussion originating from other causes (eg, road traffic accidents) were excluded. This was due to the particular needs (specifically, in RTP) associated with a sport-related concussion. The age range (16–30 years) reflected the demographic group at the highest risk of concussion due to their participation in contact and collision sports^{43,44}; participants were excluded if they were outside this age range. Participants were also excluded if their injury involved hospitalization for more than 48 hours (suggesting a more serious brain injury), if they were unable to communicate in English (either orally or in writing), or if they had concussion-like symptoms due to other reported neurologic conditions.

Participant Recruitment. Participants were able to enter iCon as soon as they had been identified and had consented. A comprehensive recruitment strategy in a provincial region of New Zealand was used that included referral from clinical staff members at medical practices and local sports injury clinics; poster advertisements at medical practices, supermarkets, sports centers, and university residential colleges; postings on Facebook groups relevant to the target population; e-mails to mailing lists for University students and staff; and word of mouth.

Once participants had consented to the study (using an online information form and consent sheet) and were enrolled in iCon, they were sent an introductory Facebook message welcoming them to the group. This message outlined the "house rules" for the group on topics including uploading and sharing links, videos, or photos; communicating with the iCF and iCon physician; and interactions with other iCon participants. Participants were invited to contribute to iCon as often as they felt comfortable, but no pressure was placed on them to contribute. Throughout the study, participants were informed that cognitive rest was a key component of early concussion management. They were therefore instructed to use iCon for short periods of time (no more than a few minutes at a time) in the early stages of their recovery from concussion and to increase their time spent participating in iCon as their symptoms subsided or if they felt this necessary or helpful.

On their entry to the study, participants were told that although iCon was likely to be of most value to them in the first 3 weeks after their concussion, they were welcome to stay in iCon after their symptoms resolved or diminished. The rationale for staying in the group was to allow those with experience and advice to serve as a support group and help newer participants, in keeping with the previous work of online support groups.⁴⁵ The 90-day period for iCon was chosen to coincide with the winter sports season, when a significant number of concussions generally are reported due to prevalent collision sports.⁴⁶ Although the intention

Table 2. A Summary of the Key Information Collected During the Pre-iCon and Post-iCon Interviews

Pre-iCon Interview		Post-iCon Interview	
Data Collected	Rationale for Collection	Data Collected	Rationale for Collection
How long participant had been a member of Facebook; frequency of using Facebook	To provide an indication of how knowledgeable each participant was and to measure any changes in Facebook use during the trial	Concussion symptoms and severity score (Sport Concussion Assessment Tool 2); worsening of symptoms with physical or mental activity	To provide an assessment of any reduction (or increase) in symptoms following iCon
Date of concussion; sport played when concussion sustained; mechanism of injury	Questions enabled a greater comprehension of the circumstances surrounding each participant's injury	How regularly participants accessed iCon; whether participants spent more time than usual on Facebook during the study period and whether this was due to iCon	To provide an indication of usage patterns during the study and to see whether participants used Facebook more than they usually would in order to access iCon
Preinjury knowledge levels relating to concussion	To establish changes in concussion knowledge after iCon	Date of return to sport; whether iCon assisted the return-to-sport decision and medical-help seeking	To give an indication of the effect iCon had on decision-making processes
Concussion symptoms and severity score as per the Sport Concussion Assessment Tool 2; worsening of symptoms with physical or mental activity	To provide an objective baseline measurement of each participant's symptoms before entering iCon	Changes in concussion knowledge; the most valuable item learned during iCon	To help identify changes in concussion knowledge after iCon
Medical treatment given after the concussion; information given postconcussion; what format this was in and who dispensed this	To identify the concussion management and education each participant was given before iCon	How satisfied participants were with the support from the iCon facilitator, iCon physician, and other participants; most and least helpful elements in iCon	To identify how well different components in iCon served their purpose
		Did participants feel secure sharing information in iCon? Would participants recommend iCon to others?	To provide an overall impression of participants' satisfaction with iCon

was that participants would remain in the study until its conclusion, they were free to leave at any time.

Pre-iCon Interview. The purpose of the pre-iCon interview was to obtain information regarding user familiarity with Facebook, as well as injury information. The pre-iCon interview and post-iCon interview questions were generated by 3 members of the research team (O.H.A., A.G.S., S.J.S.), after exhaustive discussions regarding the major factors associated with the concussive injury, its management, and subsequent RTP. The structured pre-iCon interview was conducted by telephone by the iCF immediately before the participant entered iCon and collected demographic data and other information (Table 2). Data were also collected related to concussion symptoms and severity of symptoms per the Sport Concussion Assessment Tool 2 (SCAT2),⁴⁷ and concussion knowledge was described as a self-reported score. After the gathering of data from the pre-iCon and post-iCon interviews, relevant quotes that best illustrated the content theme were extracted. Irrelevant comments (eg, “you know” and “well, umm”) were removed; samples of the quotes are included in the “Results” section.

At the end of the interview, the response to each question was read back to the participant for verification. Once the pre-iCon interview was concluded, the participant then provided the iCF with his or her Facebook username (eg, “Ed Knock”) and the e-mail address associated with the participant's Facebook account (eg, “edknock@hotmail.com”) to enable the facilitator to identify that account. Once the Facebook account was identified, the participant was added to the iCon group.

Post-iCon Interview. Participants were asked to inform (via Facebook message, e-mail, or telephone) the iCF once they had left the group, so the iCF could then arrange for the post-iCon interview to be conducted. For those participants who remained in the group until the 90-day study concluded, the follow-up interview was conducted after this time. The post-iCon interview was conducted by telephone within 1 week of exit from iCon (regardless of the mode of exit), and some of the content from this interview is outlined in Table 2. As with the pre-iCon interview, quotes were extracted from the post-iCon interview. At the end of the study, all participants were prompted to seek any further medical assistance relating to their concussion from their medical practitioner, if required.

Data Organization

In keeping with the theoretical underpinning of the study, it was important to gather data on several elements of the intervention to obtain a holistic understanding of how iCon functioned. Table 3 shows the participant demographic data, whereas the remaining data were classified into 3 broad categories:

- Outcome data: Included to show changes in the symptoms and knowledge of the participants (Tables 4 and 5)
- Operational data: Gathered to show how participants used iCon (Table 6)
- Evaluation data: Used to gauge the opinions of the participants toward iCon and their satisfaction with the support received from iCon (Table 7)

Table 3. Participants' Background Information and Symptom Scores

Identification No.	Sex	Age on Entry, y	Approximate Length of Time Facebook Account Held, y	No. of Times (Average) Using Facebook	Total No. of Symptoms (Sport Concussion Assessment Tool 2)	
					Pre-iCon	Post-iCon
1	M	19	0.5	3–4/d	9	0
2	M	22	3	3–4/d	21	4
3	M	20	2	1/d	0	0
4	M	21	6	3–4/d	1	0
5	F	19	3	1/d	15	0
6	M	18	2	1/wk	13	0
7	M	21	3	3–4/d	5	0
8	M	21	4	Every h	9	0
9	F	28	3	1/wk	9	0
10	M	20	4	3–4/d	0	0
11	M	24	2	2–3/wk	20	0

Abbreviations: F, female; M, male.

RESULTS

Participant Demographic Information

A total of 11 participants were involved in the study (Table 3). The majority of participants ($n = 7$) identified themselves as New Zealand European, whereas the other

reported participant ethnicities were Australian ($n = 2$), Maori ($n = 1$), and American ($n = 1$). Playing Rugby Union was the most common cause of concussion among the participants ($n = 6$); the other sports that led to injury were soccer ($n = 2$), basketball ($n = 1$), netball ($n = 1$), and skiing ($n = 1$). All participants had Facebook accounts and were familiar with the use of Facebook.

Table 4. Concussion Knowledge and Concussion Learning (Summary Quotes and Explanatory Context Information)

Identification No.	Self-Reported Score and Knowledge About Concussion Before Injury (1 = No Knowledge, 5 = Lots of Knowledge)	Self-Reported Score and Description Relating to Change in Concussion Knowledge After iCon (1 = Did Not Increase at All, 5 = Increased by Lots)	What Would Be the Most Important Thing You Learned About Concussion During iCon?
1	2: 1st Concussion; went to the physician (was hit in face with hockey stick)	5: Didn't know very much (about concussion) pre-iCon so found it very worthwhile	Not to go back to sport too quickly as symptoms will worsen
2	2: Knew a bit about what to do/not to do (had 2 concussions already over the past couple of years)	4: Learned a lot	How serious concussion can be (due to the videos)
3	5: Had undertaken both sports medic and physiotherapy training	4: Already knew a lot from sports medic and physiotherapy training but iCon did help	Wasn't sure whether sleeping was good or bad but iCon showed that sleep and rest were good
4	3: Never had a diagnosed concussion before but felt similar symptoms on 2 previous incidents	1: Barely used iCon as symptoms were resolved very soon post-entry interview	Concussion can have serious implications
5	2: Understood what happened with the concussion but didn't know how to manage it	5: Didn't realize there was that much information about concussion on the Internet!	No return to sport until after symptoms gone; only knew this due to iCon
6	2: Had 2 previous concussions and also had to do an assignment on concussion at school	3.5: No comment	Take a step back from contact. Let the brain heal fully before returning to sport.
7	4: From sports medics, learning from teammates and from school	4: Definitely found it very helpful, especially the links to events in America	Everything, mainly about the management of concussion
8	5: Had previous concussions, 2 or 3 at school a couple of years ago	3: It's been useful	The importance of physical and cognitive rest and absence from sport in early stages
9	2: Learned a bit from primary carers (sports medics) at sporting events	4: Learned lots	That it affects your working processes (concentration at work)
10	3: Had several concussions previously on ski team so had access to good medical backup	3: Had quite a few concussions previously so was aware of concussion but still learned a bit	Not having to be woken up—this happened to me with previous concussion
11	4: Previous concussions, study of physical education as a tertiary student; teammates had concussions, too	4: Learned a lot about all aspects of concussion	Symptoms and what to look out for after a concussion

Table 5. Influence of iCon on Return to Sport (Summary Quotes and Explanatory Context Information)

Identification No.	Have You Returned to Sport?	Did You Seek Medical Clearance Before Returning to Sport?	Did iCon Assist Your Decision as to When to Return to Sport?
1	Yes	Yes—from a physician	Yes, video about girl getting injured with repeat concussion helped awareness. A graded return to sport was followed and inspired confidence as a result; approximately 2 years ago, was charged into while playing hockey; concussion was never diagnosed; would have liked iCon then
2	Yes—but not full contact	Yes—went to see physician due to iCon	Yes, about importance of rest and importance of symptoms resolving
3	Yes	No—felt OK	No—already knew guidelines from physiotherapy training
4	Yes	No	Partially via the information on iCon, although did not check with iCon facilitator or iCon physician
5	Yes	No—but spoke to facilitator on iCon	Yes—would have gone back sooner if not for iCon
6	No—season finished before symptoms resolved; could have played last few games but decided to rest instead	NA	Yes—emphasized importance of allowing the brain to heal
7	Yes	No	Yes—conservative approach taken was due to iCon
8	No—season finished and did not return to training; was knocked out a few times and is going to have a year off (mainly due to studies); might return to rugby at a later date	NA	Yes—taking time off
9	Yes	No	Yes—graded return to sport (wouldn't have otherwise)
10	Yes	No—knew what to do from previous concussions	No—took decision independently; confident in management of concussion from previous concussions
11	Yes	No—physiotherapy for an unrelated condition	Yep, definitely

Abbreviation: NA, not available.

Outcome Data

A summary of the “cleaned” quotes from the pre-iCon and post-iCon interviews is provided in Tables 4 and 5. As shown in Table 4, almost all of the participants (10/11) reported that their concussion knowledge had increased during iCon, with only 1 participant (No. 4) indicating no change. Key learning points highlighted by the participants after iCon consisted of the need to rest after concussion (including allowing undisturbed sleep); the importance of a graduated RTP; and the need to be symptom free before RTP. Table 5 also demonstrates that iCon had a notable effect on RTP decisions, with 9 of 11 participants stating they were better informed about their RTP due to their involvement in iCon. However, of these 9 participants, only 2 followed the advice provided by iCon regarding seeking medical clearance before their RTP.

Operational Data

To show the extent of participants' interaction with content in iCon, we also recorded activity data. It was not possible to see when participants had logged in; therefore, this was determined by the visible contributions that

participants had made to the group or to the iCF. Three participants (No. 3, No. 4, and No. 11) had no activity recorded for their time in iCon. Of the remaining participants, only 1 (No. 1) sent private messages to the iCF, with all the other participants (with the exception of No. 6) making 1 or more public posts in iCon. The option of “liking” content on Facebook was used by 3 participants (No. 1, No. 2, and No. 5). A total of 5 topics from 4 participants (No. 1, No. 2, No. 5, and No. 7) were considered outside of the iCF's scope of practice and were therefore referred to the iCon physician.

In addition to these activity data, the post-iCon interview contained questions relating to the participant's use of iCon; the quotes from these interviews are summarized in Table 6. Participants reported visiting iCon for varying durations, with 5 participants stating that they interacted with iCon 3–4 times each day and all participants spending between 2 and 30 minutes on iCon during each visit. Almost all the participants (10/11) stated that they did not use Facebook during the study period more than they would usually, with most of these ($n = 9$) suggesting that their similar usage patterns of Facebook during the study period were not related to any worsening of symptoms. One

Table 6. Details of Facebook Use During iCon (Summary Quotes and Explanatory Context Information)

Identification No.	How Often Did You Use Facebook During iCon?	How Much Time Did You Spend on iCon per Day?	During iCon, Did You Use Facebook More Than Usual?	If Yes, Was This Because of iCon?	If No, Was This Because of Your Symptoms?
1	2×/d, Approximately 30 min each time	Would check iCon twice every day; depended on what was posted; would be on for longer if more postings	No—used Facebook less while concussed	NA	Yes—headache came on when first was online after concussion so didn't use Internet as much
2	3–4×/d	At least 1×/d, for 5–10 min, watching videos and reading stories	Yes	Wanted to check for new news daily	NA
3	1×/d	Approximately 5 min on most days (depending on content)	No	NA	No—just used it same as usual
4	3–4×/d	Only checked into iCon 3 times in total, under 2 min each time	No	NA	No—did not use iCon extensively as symptoms were much improved; therefore, Facebook usage was the same
5	1×/1–2 d	Would check iCon most days, 4–5 min each time	No	NA	No—used it about the same as usual
6	2×/wk	10–15 min, Reading posts and information	No	NA	No—used it as normal
7	3–4×/d	30 min Most days; wanted to read everything	No	NA	No—used it as normal
8	3–4×/d	2–3 min	No	NA	No—just used Facebook as per usual
9	1×/wk	5–10 min (Each time was on [Facebook]), didn't always comment but read articles all the time	No	NA	No—same as usual
10	3–4×/d	New notifications only—approximately 2 min each time	No	NA	No—used it as per usual
11	2× During study	5 min Each time (10 min total)	No	NA	No—used it like usual

Abbreviation: NA, not available.

participant (No. 2) reported using Facebook more than usual because of iCon during the study *to check for new information daily*.

Evaluation Data

One of the key study measures was the participants' satisfaction with iCon. To allow us to better understand their satisfaction with the different elements of support in iCon, they were questioned with regard to their satisfaction with the iCF, iCon physician, and the other participants. The satisfaction scores and accompanying quotes demonstrating that the participants felt supported through iCon are shown in Table 7. Maximum satisfaction scores (5/5) were reported by 8 of 11 participants for the support from the iCF and iCon physician. Fewer participants scored the support from the other participants as highly beneficial, although 4 of 11 participants also stated that they felt *very satisfied* with the support from their peers. The quotes accompanying the satisfaction scores for support from the other participants highlighted the lack of interaction among participants as a potential explanation. All the participants stated that they felt secure in sharing information in iCon, and they raised no concerns regarding security. The final question of the post-iCon interview asked whether the

participants would recommend iCon, and all participants (N = 11) stated that they would.

DISCUSSION

The primary goal of our study was to evaluate the feasibility of a novel and innovative approach to concussion management and, in doing so, to drive and inform future research. This innovative program is one of the first examples of a social-media approach to facilitate safe RTP after a sport concussion. One of the key findings was that all participants (N = 11) stated that they would recommend iCon to others. The post-iCon interview data indicated that iCon showed the potential to be successful on a larger scale, with supporting quotes such as “All questions asked were answered really quick, and it was easier than phoning the physician and asking for advice” (Participant No. 5), suggesting that the use of Facebook as an adjunct for concussion management appealed to this cohort of individuals. Other indications of iCon's success were the satisfaction scores and accompanying quotes, which reflected that the participants were predominantly *very satisfied* with the support they were given in iCon, from the iCF, iCon physician, and other participants.

Table 7. Satisfaction With iCon (Summary Quotes and Explanatory Context Information)

Identification No.	How Satisfied Were You With the Support Received From the iCon Facilitator and iCon Physician? (1 = <i>Very Dissatisfied</i> , 5 = <i>Very Satisfied</i>)	How Satisfied Were You With the Support Received From the Other Participants? (1 = <i>Very Dissatisfied</i> , 5 = <i>Very Satisfied</i>)	Did You Feel Secure in Sharing Information in iCon?	Would You Recommend iCon to Others?
1	5: I thought the referral [of comments] on to the iCon physician was a good system and was happy with how quick they answered 5: It was a good service from both of them	5: I wasn't worried about posting as everyone was in same boat, so I felt secure	Yes—once more people were in the group, most of my symptoms had gone though	Yes—definitely
2	5: I didn't need it personally, but the support for the others seemed excellent	3: When I commented, someone usually commented back, but there was not much dialogue 4: I didn't interact with the others, but I would have been happy to	Yes—no problems	Yes—I've already done that to my friend with concussion
3	5: It was very easy to join the group, and I felt like I was shown sympathy in the entry interview	3: I didn't interact with others in the group, so hard to say	Yes—definitely	Yes
4	5: All questions asked were answered really quick, and it was easier than phoning the [general practitioner] and asking for advice	4: I didn't have much interaction with others in the group	Yes—I didn't post in the group, but I would have been happy to	Yes—would have used it more if symptoms were worse
5	3.5: I could have used it more but the support was OK 5: It was all very knowledgeable 4: It was good	4: Everyone was in the same boat, which was encouraging 5: I posted and people were helpful 3: More interaction between people in group would have been good 5: Everyone was contributing 3: Not much interaction with the others, but then I didn't initiate much anyway	Yes—I'm not too worried about privacy as there was not very sensitive information discussed	Yes—if they were concussed
6	5: It was great medically 5: It was sweet	5	Yes—I'm not too concerned and trust all the people in there Yes—I'd have no concerns Yes—no problems	Yes—especially if Facebook is your thing Yes—I definitely will do Yes—it was very useful
7			Yes—definitely	Yes
8			Yes—the group was secret, so no one would know what people were saying; that was good	Yes—definitely
9			Yes	Yes—for sure
10				
11	4: I didn't interact, but it looked good	5		

A notable aspect of the intervention was that the majority (8/11, 73%) of participants stated that their RTP decisions were influenced by iCon. Education is recognized as crucial in the management of sport concussion,⁴⁸ and the importance of this knowledge-transfer process in concussion has been highlighted in the literature.^{49,50} The post-iCon questionnaire data indicated that using iCon directly affected the participants' decision making in seeking a more conservative RTP; we inferred that the participants would also be better informed of the need to seek medical review in the event of a future concussion. Our study was not designed to analyze the long-term behavioral changes of the participants; thus, we have no way of knowing whether there were any long-term changes in this behavior or retained concussion knowledge.⁵¹

We anticipated that most participants in the study would see a reduction in their symptom scores regardless of their participation in iCon, and this was confirmed by the data. Although we assumed that the self-reporting of symptoms by telephone in the pre-iCon and post-iCon interviews was accurate, it must be acknowledged that differences in concussion-symptom reporting have been found between interviews and self-reporting questionnaires.⁵² Participant activity in iCon was not expected to be uniform, and it was thus unsurprising that 3 participants (No. 3, No. 4, and No. 11) had no activity at all recorded for their time on Facebook. This does not mean that these individuals did not use iCon during the study period but rather that they did not make any public postings in the group. It may have been that these participants demonstrated the behavior of "lurkers" (passive participants in online groups); a study⁵³ showed that lurkers may gain as much benefit from online groups as active posters. Although the post-iCon interview did not question this explicitly, the satisfaction scores for these 3 participants were high (4/5 or 5/5) and reflected some benefit from participating in iCon. Earlier work²⁹ has identified individuals with concussion supporting one another in Facebook concussion groups; however, in iCon, relatively little iSupport was witnessed among participants in terms of offering messages of support relating to concussion. It may have been that interactions occurred through private messages among participants in iCon, but we were not able to measure this because private messages are visible only to the sender and recipient.

Although the use of Facebook for social support by individuals with traumatic brain injury⁵⁴ and concussion²⁹ has been investigated, the use of Facebook by health care professionals to assist in recovery after a sport concussion is a new concept. This innovative method of interacting with concussed athletes is associated with myriad ethical factors,⁴¹ with a major consideration being the concept of cognitive rest.⁵⁵ The 2008 CIS consensus statement,⁴² which constituted the guiding principles at the time of this study, discussed the importance of cognitive rest after concussion, and this has been further reinforced in the most recent consensus statement.³ It could be argued that using Facebook when recovering from concussion is contrary to this advice. However, we agree with others⁵⁶ that total cognitive rest is impractical and that using social media for concussion management in a controlled manner could be beneficial to the recovery process. The 2012 CIS consensus statement³ did not advocate total cognitive rest; Gibson et al⁵⁶ also suggested that prolonged cognitive rest after

concussion is not entirely advisable and should be approached cautiously. We took steps to address this factor; at the time of joining iCon, participants were clearly instructed to cease using Facebook if their symptoms worsened and to use iCon only for limited periods in the early stages after their injury.

Despite sustained efforts and an extensive recruitment process, only 11 participants were enrolled in the study, representing a relatively small sample. The timing of the study coincided with the winter sports season, when concussion rates were highest, and as a result, we expected that a larger number of participants would be recruited. Reasons for the relatively small sample size could include the lack of reporting or recognition of concussion. Several groups have highlighted that concussions are typically underreported in young rugby players^{57–59} and in sports in general.^{60–62} This lack of reporting would have limited the ability of local medical personnel to alert these individuals to the study. The process of knowledge transfer is possible only if individuals are keen to participate in their self-management, and this lack of engagement is a barrier that needs to be overcome if concussion interventions such as iCon are to be successful on a larger scale. Given the sample size in this group, success of this approach in a larger population cannot be guaranteed. The nature of an intervention such as iCon is that the information within it is fluid, and therefore, the content and advice could be targeted to a specific group, organization, or sporting code. This may be beneficial for athletic trainers working with different sporting populations and could assist in their efforts to manage concussion at a state level. Athletic trainers frequently have to manage sports concussions in their clinical environment, and novel methods to improve compliance with concussion management should be encouraged. In some instances, it is not appropriate or feasible for individuals with concussion to return to the clinic for follow-up; innovations such as iCon may serve as a mechanism athletic trainers can use across multiple environments.

Inclusion criteria for iCon did not specify that participants needed to be symptomatic to enter the group, only that they needed to have had a sport-related concussion within the past 3 weeks. As a consequence, several participants reported no or very few concussion symptoms on entry to iCon. It can be speculated that these participants might have benefited more from their participation in iCon if they were enrolled in the study sooner after their concussions, while they were still symptomatic, because the information given to them in iCon would have assisted in the management of their symptoms. Earlier identification and enrollment of participants would enable this to be evaluated. The financial implications involved are difficult to predict, but rolling out a system such as iCon on a larger scale may incur costs from the length of time needed for multiple clinicians to develop and maintain accurate information as well as review and respond to posts from participants. A final consideration is that the pre-iCon interview did not ask how participants primarily accessed Facebook; namely, whether they did this via a desktop computer at school, work, or the university; on a laptop computer; or via a mobile device (a cell phone or tablet such as an iPad). Further questioning about the method and location of access may provide additional insight into how

participants accessed iCon and thus also help to shape the design of future online concussion interventions.

This interactive adjunct to traditional concussion-management strategies was appreciated among this participant group and indicated feasibility for a future, larger study of iCon. Given the relatively low number of participants in this trial, one way of ensuring larger numbers in the future would be to conduct a multicenter trial (especially given the current greater awareness of concussion). Larger participant numbers would have a consequential effect on the moderation of the group and may require more than 1 individual to perform the roles of iCF and iCon physician. Since this study ended, the use of smartphone apps for health, including in the field of sports medicine, has risen sharply.^{25,63} Innovations such as online health interventions evolve and change over time⁶⁴; at present, the use of smartphone apps for concussion management is gaining attention.^{25,65} In addition to a future trial of iCon, further exploration of concussion-related technologies is warranted to assess their role in assisting with the management of sport concussion.

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