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Mobile Phone Text Messaging in Military-Related Chronic Concussion Management

Over 260,000 military service-members (SM's) have sustained a mild traumatic brain injury (mTBI) since 2001¹, and over one third of these concussions result in chronic physical, sensory, emotional, and affective symptoms that significantly impair SM's daily functioning, decrease quality of life, and limit ability to return to full active duty². Unfortunately, several barriers exist to treatment of this population, including lack of evidence on effective management and the existence of multiple comorbidities in many individuals³. Additionally, the inherently ultra-masculine environment of the military places a negative stigma on receiving treatment, and the busy, mobile nature of the military occupation often discourages SM's from participating in therapy and complicates consistent treatment and monitoring⁴.

One recently proposed mechanism for moving past these barriers in the military population is the use of mobile phone technology in both research and clinical management of individuals with chronic concussion symptoms⁵. As of the year 2015, 92% of American adults report owning and using a cell phone⁶, and the quick communication often necessary in the military environment may result in most SM's consistently checking their mobile phones throughout the day⁵. Specifically mobile phone text messaging has been shown to effectively reduce symptoms, result in high patient satisfaction, improve treatment adherence, and increase targeted healthy behaviors in various other chronic health conditions, including diabetes, depression and

anxiety, obesity, alcoholism, asthma, and hypertension^{7,8}. Preliminary self-report studies also show that the use of technology-based therapy may increase likelihood of military SM adherence and willingness to participate after experiencing an mTBI⁹.

The use of text messaging to assess symptoms and provide support after traumatic brain injury has been shown to be a feasible and cost-effective option in several studies. One recent pilot study of 29 patients post-TBI found that a daily text message sent at a previously agreed upon time for 14 days asking patients to rate symptoms of post-traumatic stress (PTS) resulted in a high response rate (82%) and low staff time-commitment and cost¹⁰. Importantly, this study also found that the majority of patients found the texts helpful for managing their symptoms¹⁰. Patients also expressed high satisfaction with the frequency of one message per day, rather than more or less¹⁰. This pilot study is descriptive in nature and utilized a small convenience sample, but its findings suggest that text messaging may be an effective monitoring and management tool in the post-TBI population and warrants further randomized research.

One randomized controlled trial investigated the effects of educational and behavioral support text messages on post-concussive symptom severity and quantity, as well as assessed the feasibility of this type of daily symptom assessment and support system¹¹ for individuals following mTBI. For two weeks, all participants received three daily text messages at set times throughout the day asking them to rate somatic (9am message), concentration (1pm message), and irritability/anxiety (5pm message) symptom severity over the past 24 hours on a 5-point scale. Based on their response, participants received an automated feedback message to confirm their response, but only the intervention group received a second text providing symptom-specific

education, reassurance, and management guidance. Response rate was very high in this study as well, ranging from 74% to 97% with the 9am time having the lowest response rate. Intervention group symptom scores were significantly reduced for somatic symptoms and lower on average for concentration and irritability/anxiety domains. Those who received the text messaging intervention also had significantly lower irritability and anxiety at the end of the study than those who did not receive the intervention. Somatic and concentration scores were on average lower for the intervention group, though not at a statistically significant level. Upon completion of the study, 93% of intervention participants reported that the texts were helpful in self-managing their symptoms and all reported that the texts helped them better understand their symptoms.¹¹ Again, this study utilized a relatively small convenience sample, which could have played a role in some results not reaching a statistically significant difference between control and intervention groups. However, utilization of an automated text-messaging system was shown to be feasible, result in high patient satisfaction and response rates, and have good potential for improving patient symptoms and self-efficacy for managing their condition.

Current research is in the preliminary stages and lacks consensus on the most effective frequency of texts or type of questions to be included in texts. There is also a dearth of evidence utilizing text messaging to assess reaction to actual treatment, such as home exercise programs or cognitive rehab. Research in the military and chronic concussion populations is lacking at this point, as well. However, the findings of reduced severity of PTS symptoms¹⁰, as well as decreased irritability and anxiety¹¹ have positive implications for text message utilization with SM's since PTS symptoms and generalized

stress or anxiety can often increase severity and duration of mTBI symptoms in SM's^{12,13}. Based on the current evidence, a text message system for patients after concussion has good potential for feasible use in future studies and treatment to monitor symptoms and provide support in the post-mTBI population. The positive preliminary results warrant further research in military and chronic concussion populations, as well as future study to determine optimal frequency and length of texts.

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