



## Pitfalls in the use of mobile wireless devices in healthcare: Distraction, errors, procrastination, and burnout

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*The screen of my mobile wireless device glows, notifying me of a new message. Instinctively, I reach for it, meanwhile looking away from my work on a patient chart. I read the message, send a reply, and then proceed to scroll through my email. I also check the calendar and swipe my social media feed. When I look back at the unfinished patient chart, I realize that I have lost my train of thought and nearly 20 min of the workday.*

While mobile wireless devices (MWDs) have become indispensable tools in many healthcare settings, concerns have been raised regarding the negative implications of overly frequent use and the addictive nature of these devices.<sup>1</sup> Here, the term 'MWD' refers to a device that is portable and uses a wireless network to send and/or receive information. An average American accesses information on a MWD approximately 96 times a day, or once every 10–15 min. This creates a substantial loss of work time that extends well beyond the time elapsed while engaging with the MWD. For example, Mark et al.,<sup>2</sup> reported that more than 25 min are required to reorient oneself to an interrupted task. Furthermore, the findings reported by this group suggest that frequent MWD users compensate for the time lost by working faster, and are thus more likely to encounter more stress and higher levels of frustration.<sup>2</sup>

Uncontrollable MWD use has been linked to the *incentive sensitization theory of addiction*, in which repeated exposure to potentially addictive stimuli results in persistent structural and functional changes in the prefrontal cortex.<sup>3</sup> This ultimately results in impaired executive functioning and cue-reactivity. Excessive MWD use has a clear impact on sleep and can result in increased reaction times, reduced work performance, and impaired cognitive abilities.<sup>4</sup> This form of compulsive behavior might also be driven by a hyperactive dopamine system which might lead to

the formation of an addictive habit-loop (i.e., cue, craving, response, and reward).<sup>5</sup> This theory suggests that specific cues (e.g., notifications) elicit dopamine release followed by an immediate craving (e.g., the immediate need to focus on the MWD). The MWD user then responds (e.g., reaches for the device) and is rewarded (e.g., feels relieved once the text, email, or post has been read) (Fig. 1).

It is not clear whether MWD notifications that contain work-related information are similarly disruptive.<sup>2</sup> For example, it is not clear whether text or an email message with patient laboratory results that matched the task-at-hand (e.g., arranging for the discharge of a patient) will create as much of a workflow interruption as one that was unrelated or purely personal in nature. It is critical to recognize that, although one might not be actively spending time on notices that disrupt productivity, the individual in question might be distracted by personal issues once he or she has engaged with the MWD.<sup>6</sup>

In addition to the risks concerning patient privacy and security, interruptions from MWD use while engaged in patient care have been reported to increase the number of clinical errors.<sup>1,7,8</sup> As but one scenario, Hoppel<sup>7</sup> reported a case in which a physician accessed a MWD to enter an important order, but was distracted by a text message from a friend. Unfortunately, the physician forgot to enter the order which led to a life-threatening clinical complication a few days thereafter. Similarly, a 2011 survey of 439 perfusionists in the US revealed that 55.6% used a cell phone to send text messages, access email, browse the internet, and/or check and post on social networking sites while managing cardiopulmonary bypass procedures.<sup>8</sup> Likewise, a cross-sectional survey of residents and faculty at a teaching hospital in New York showed that MWDs were used during rounds to read and respond to personal texts and emails (37% residents, 12% faculty) as well as other non-patient

Abbreviations: apps, applications; MWDs, mobile wireless devices.

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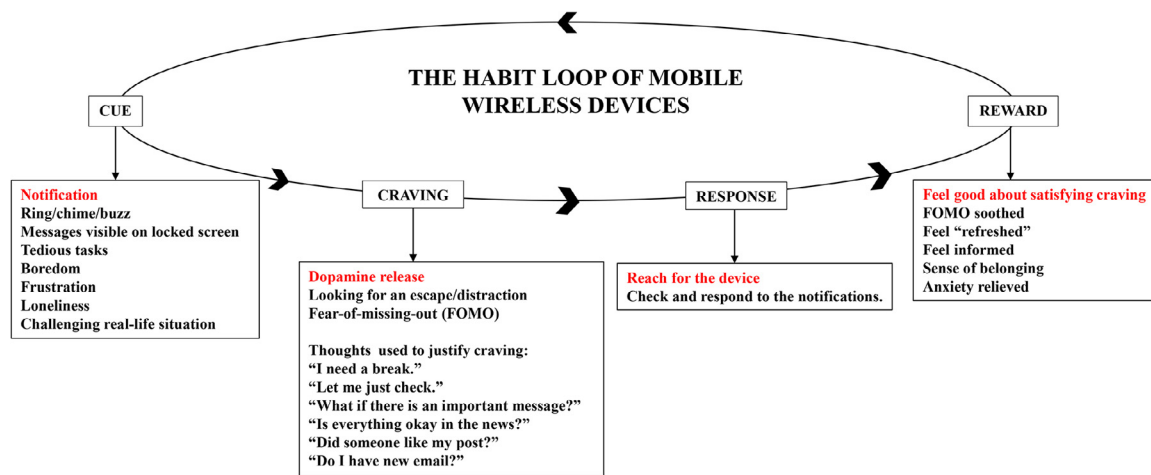
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**Fig. 1.** A habit-loop develops with excessive use of MWDs. A cue (e.g., a specific notification or feelings of boredom or frustration) leads to the release of dopamine in the central nervous system. This physiologic response elicits a craving to engage with the MWD. The user responds by reaching for the device and feels relieved and/or stimulated by reading the text, email, or post (i.e., the reward). Over time, the positive reward becomes associated with the cue. Eventually, this might result in MWD addiction.

care uses (15% residents, 0% faculty). Of note, most of the respondents in this study agreed that MWDs can be a serious distraction during rounds and that important information might be missed.<sup>9</sup>

A spectrum of behavior has been noted in the use of MWDs that transitions from MWD use to overuse to dependency and eventually addiction.<sup>5,10-12</sup> Multiple criteria/scales have been proposed for delineating this behavior pattern and identifying the degree of problematic MWD use.<sup>5,10,11,13,14</sup> These criteria have several similarities to the criteria used for diagnosing other forms of addiction.<sup>5,15</sup> The common themes that emerged from the different MWD addiction scales included preoccupation with the device, using the MWD to escape or relieve a negative mood, a longer time of use than initially intended, positive anticipation, inability to focus on other activities, continued excessive use despite knowledge of negative consequences, withdrawal symptoms of irritability and anxiety when away from the device, unsuccessful attempts to cut down the use and jeopardizing/losing a significant relationship/job/educational opportunity.

A MWD user can become so engrossed with its content that they might choose to *escape and displace* or procrastinate, leaving the primary task incomplete.<sup>16</sup> Recent research has suggested that an interrupted task may not be resumed immediately in ~23–45% of cases,<sup>2</sup> thus promoting further procrastination and redundancies as the person reorients to this work at a later time. Likewise, the higher the perceived difficulty or boredom associated with a given task, the higher the odds of engaging with a MWD as a means of *escaping or displacing*.<sup>3</sup> Over time, the tasks pile up and are then perceived as even more tedious. This can lead to constant subconscious stress over unfinished work.

High rates of MWD addiction have been reported among healthcare professionals, with values ranging from 20%–90%.<sup>17-24</sup> This can lead to energy depletion and burnout. The term burnout has been characterized by three dimensions, (1) feelings of energy depletion or exhaustion (e.g., due to lack of sleep, healthy nutrition, exercise), (2) increased mental distance from one’s job or feelings of negativism or cynicism related to one’s job (e.g., compassion fatigue, reduced sense of purpose and meaning in work and life), and (3) reduced professional efficacy.<sup>25</sup> There is strong evidence linking MWD dependency/addiction with the exhaustion of a healthcare professional’s physical and emotional energy accounts.<sup>23,24,26-28</sup> In addition, excessive use of MWDs frequently replaces physical activity, sleep, and face-to-face interactions with friends and colleagues. This phenomenon has the potential to lead to an even higher risk of developing mental health disorders and burnout considering the inherently stressful nature of the healthcare workplace.

What can be done to mitigate the negative effects of excessive MWD use? As the pathophysiology of substance abuse is similar to that of behavioral addiction,<sup>3</sup> it might be helpful to begin with the time-tested protocols that focus on the disruption of the habit loop. We suggest that the following practical strategies might be used to optimize workflow and physician well-being (Fig. 2):

**Step 1: Reduce the cues that facilitate engagement with MWDs**

1. Turn off notifications except for those that are most essential.
2. Turn off all badges.
3. Consider wearing a wristwatch rather than using the MWD to check the time.
4. Exit redundant group chats.
5. Use features such as Auto-reply and Focus to silence notifications during the workday.

**Step 2: Curb the dopamine-driven craving to check MWD**

1. Pause, blink several times, stretch, move, and hydrate; then redirect your attention to the task at hand.
2. Actively address the part of the brain that is seeking distraction; say to yourself “I know I am trying to procrastinate, but it would feel good to get this task done without further distraction.”

**Step 3: Weaken the response**

1. Place the MWD in a desk drawer and avoid accessing it for 30 min. The duration of these intervals might be increased over time.
2. Plan to work in uninterrupted blocks of time of 30–90 min in duration.
3. Keep a sticky note and pen handy to write down thoughts that might interrupt the workflow.
4. Turn off biometric authentication such as face ID or fingerprint unlock. Instead, use a complicated passcode that will be less convenient and might lead to reduced MWD use.

**Step 4: Eliminate the reward**

1. Remind yourself that MWDs can be used as tools, not distractions.
2. Delete all social media applications. These sites can be accessed by a web browser when needed.
3. Keep only the most important apps on the home screen.

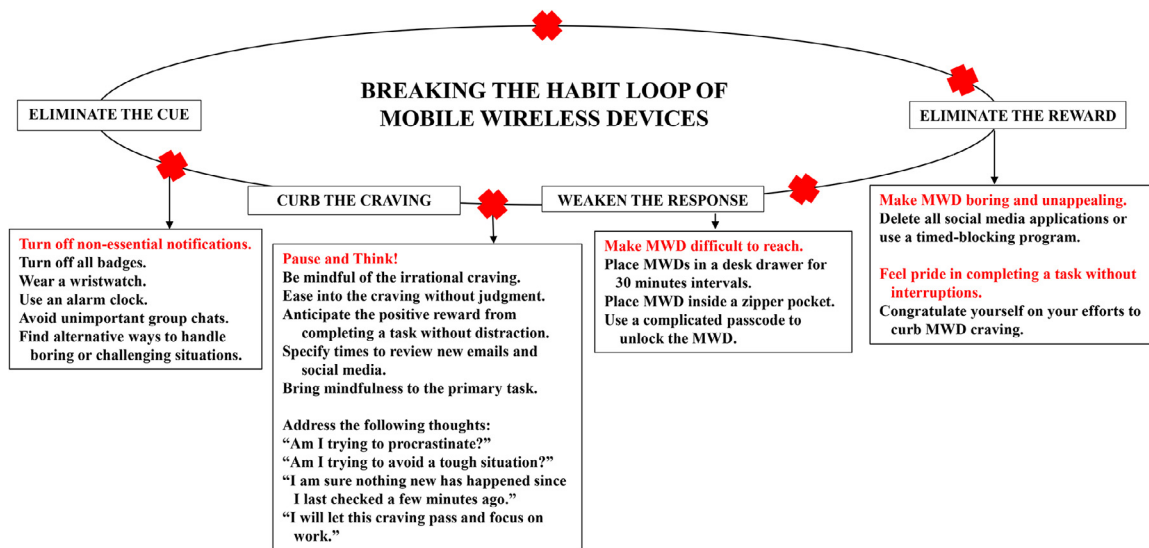


Fig. 2. Strategies that can be used to break the habit-loop and achieve a more sustainable life-technology balance in the workplace.

4. Transfer all time-consuming apps to a folder so that they are not immediately visible on the home page.
5. Turn the MWD to a “grayscale” display so that the remaining apps will not be as visually enticing.

**Step 5: Streamline emails**

1. Set specific times to review new emails. Log out of the email account at all other times and block all notifications.
2. Batch process emails quickly and efficiently.
3. Specify a device (MWD or desktop) for accessing email to avoid duplication and redundancy.
4. Unsubscribe from all redundant marketing emails.
5. Create a secondary email account for shopping and registrations.

**Step 6: Refocus the team**

1. Refocus your team to decrease their reliance on text messages and the expectation of immediate responses to all communications.
2. Redirect the team to send non-urgent messages via electronic medical records instead of text.
3. Schedule a regular team meeting to facilitate batch processing of queries.
4. Avoid work-related non-urgent texting after hours. Use email instead.
5. At meetings, engage everyone’s attention by requiring MWDs to remain at employees’ desks or in airplane mode.

**Conclusion**

Mobile wireless devices are frequently a source of distraction, errors, procrastination, and inefficiency in healthcare settings. Excessive MWD use can lead to a diminished sense of well-being and burnout. Balance and moderation will be critical to facilitate life-technology-work balance. Toward this end, healthcare professionals might aspire to mindfulness, engagement, and well-being rather than distraction and procrastination. We hope that the insights and strategies presented here might inspire good health and appropriate MWD use by our colleagues.

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