Improving medication adherence using KARIE, an electronic medication delivery device

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Canadians spend over $30 billion every year on prescription drugs for treating, managing, and preventing disease (1). Many people have multiple prescriptions for several chronic diseases, and adhering to their medication schedules often becomes difficult to manage (1). Medical adherence in long-term therapy is the extent to which a person's behavior—taking medication, following a diet, and executing lifestyle changes, for example—corresponds with agreed recommendations from a health care provider (2). Patients are considered "adherent" if their medical adherence percentage is greater than 80 per cent (3). Regarding prescription drugs, non-adherence is a serious issue because it can lead to the mismanagement of chronic disease; an increased risk of adverse drug reactions; higher rates of physician consultations, hospitalizations, and emergency room visits; increased health care costs; and decreased quality of life (4-6).

A systematic review from 2014 found that electronic medication packaging (EMP) interventions, which dispense drugs and monitor consumption, were associated with an increase in medication adherence (7). Over the summer of 2017, we helped conduct a pilot study led by Dr. Pascal Tyrrell at the University of Toronto to assess the feasibility of KARIE, a medication delivery device designed and produced by AceAge, as an intervention for improving medication adherence (Figure 1).

In this randomized, cross-over study using omega-3 supplements, medication adherence data was collected from ten students at the University of Toronto for six weeks. There was a three-week intervention period using KARIE and a three-week control period using the original bottle packaging. During the intervention period, the device rang and flashed to remind participants to take the supplements, and it also sent an email reminder 30 minutes after a missed dose. During the control period, participants took the supplements from their original packaging. Medication adherence was recorded by KARIE's electronic log of dispensed doses during the intervention period and the participants' weekly self-report recall questionnaires during the control period.

Figure 1: The KARIE automatic drug dispenser, an electronic medication delivery device.

The results showed that with an 80 per cent threshold for successful adherence, only two out of ten participants were considered to have been adherent during the control phase. During the intervention phase, however, eight out of ten participants were adherent. This amounted to a 300 per cent increase in adherence (Figure 2). Indeed, most of the participants found the device easy to use and effective in reminding them to take their supplements.

In the fall of 2017, the Centre for Aging and Brain Health Innovation (CABHI) invested $8.3 million in senior care improvement projects, which included AceAge's KARIE under its Industry Innovation Partnership Program (I2P2). In the spring of 2018, KARIE will undergo a randomized control study with 300 elderly participants at two sites: Westpark Healthcare Centre in Toronto, Ontario and Capital Care Group in Edmonton, Alberta. This study aims to determine factors affecting the usability of KARIE, its perceived usefulness by the participants, and whether it is associated with improved medication adherence (8).

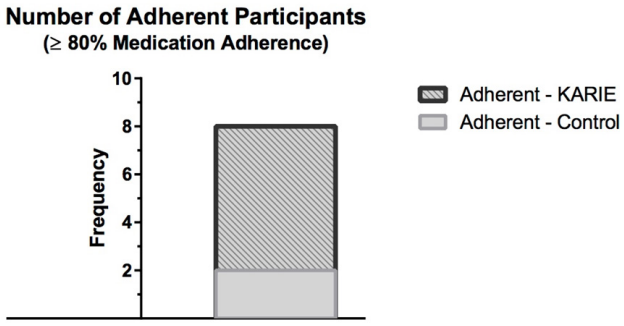

Figure 2: Number of adherent patient. Two out of ten participants in the control phase had ≥80 per cent medication adherence, while eight out of ten participants during the KARIE phase had ≥80 per cent medication adherence.

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