The Promise and Disconnect of Electronic Adherence Interventions

Population Health Sciences

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Disparities in childhood asthma outcomes – including emergency department visits, hospitalizations and asthma-related deaths – persist despite years of effort to reduce them. Regular use of controller medications has been shown to decrease all of these outcomes. Yet, children prescribed daily controller medication generally take about half of the prescribed doses, and studies in high-risk minority children have demonstrated adherence rates of only 11% to 45%.

A number of recent studies in lower-risk populations have demonstrated dramatic improvements in adherence rates using electronic reminder systems. Yet how these systems might work in the highest-risk minority populations is not known. Additionally, the promise of these technologies is balanced by a disconnect in how to best implement them in vulnerable populations. With this in mind, our research team partnered with a local Medicaid managed care plan to assess the feasibility and acceptability of an electronic monitoring controller adherence intervention among children with the highest use of hospital asthma care in West Philadelphia.

Using community health workers experienced in asthma care and trained in motivational interviewing, we enrolled 14 children who had an average of nearly eight asthma-related emergency and hospital visits in the last year (>95 percentile for ED and hospital use for asthma in the CHOP care network). Within the cohort, the average age of participants was 3.5 years, and all children were black. We affixed Bluetooth-enabled electronic inhaler monitoring devices to their rescue and controller medications, provided them with cellular modems that automatically uploaded inhaler use onto an adherence monitoring web platform, and programmed pre-defined medication use alerts. Community health workers would then contact families when they underused daily

controller medicines or overused rescue medications. The community health workers worked with families to enhance daily controller use and connected families with nursing triage for rescue medication overuse.

Each family who completed the final study visit not only liked the devices and appreciated the support of the community health worker but also stated that they would recommend the intervention to friends. We did, however, encounter a number of challenges that should be considered in future efficacy studies. Though all families initiated use of the electronic monitoring devices, we lost modem signal on five families over an average of 45 days; and of the 16 devices that were returned during the final study visit, only six were sufficiently charged to transmit data. A number of families reported that they unplugged the cellular modem because they needed the electrical outlet for something else or were worried about the cost of electricity the modem and charger were using. Given these issues with electronic monitoring, we only had reliable data on medication use for the first 30 days. The data from these 30 days demonstrated qualitatively different controller medication use patterns, which we characterized at sustained, intermittent and lapsed.

The findings of this feasibility study highlight some of the important considerations when adapting technology-oriented interventions to families of high-risk children with asthma. First, important practical considerations, like providing power strips or devices that don't require frequent charging, may mean the difference between having interpretable results or not. Second, backup supplies may be needed for families that lose or break electronic devices. Third, high-risk families have different patterns of medication use that may be important to understand in order to target those who are at greatest risk of lapsed use and tailor interventions to what is driving these lapses. We hope that these feasibility findings help others to assess the efficacy and cost-effectiveness of similar interventions that leverage technology for high-risk children with asthma and other conditions. The bottom line is that electronic medication monitoring interventions may have promise in high-risk asthma populations, but they are not yet ready for mainstream adoption.

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