Self-management mobile applications

Intervention in brief

System wide:	**Self-management mobile applications** are interactive digital health tools for patients' phones and tablets that aim to promote skills to manage disease symptoms. The goal is to help patients adhere to care plans and prevent symptom exacerbations.
Strength of evidence	 Low Although the body of evidence includes a number of systematic reviews, few are based in the U.S. or administered by a health care provider. Outcomes range widely and rarely evaluate long-term impact.

Impact	• **Decreased cost:** Not demonstrated
	• **Decreased utilization (wide range):** Insignificant to 0.84 decreased hospitalizations per patient per year; insignificant to 17% decreased odds of ED visit; 0.95 fewer unscheduled visits per patient per year; insignificant impact on hospital length of stay; 29 percentage point fewer primary care visits[1]
	• **Improved quality, clinical outcomes (wide range):**
	  • *Clinical*: Insignificant to 1.39 percentage point decreased HbA1c levels; 37 L/min increased expiratory flow rate for patients with asthma[1]; 9 percentage point increased expiratory volume[1]; 39.2 mean difference in peak expiratory flow rate; 8.70 mean difference in forced expiratory volume; 53 percentage point increased blood pressure control[1]; 864 increased step count
	  • *Adherence*: Insignificant to 12 percentage point increased medication adherence[1]; 5 percentage point decreased to 33 percentage point increased adherence to care plan[1]; 9-32% attrition rate; 91.4 percentage point increased blood pressure measurements documented in EHR
	  • *Insignificant impacts*: Patient scores on questionnaires assessing patient control, knowledge, attitude, and self-efficacy regarding asthma; occurrence of asthma-related complications; asthma symptom score; patient-reported diabetes distress; exacerbations of COPD; smoking cessation rates; BMI among patients with type 2 diabetes; depression; diabetes symptoms; blood pressure; self-efficacy; and self-care activities
	• **Increased access:** Not demonstrated
	• **Improved stakeholder satisfaction (wide range):** Insignificant to 17 percentage point increased quality of life[1]; 0.15-0.32 standard mean difference in health-related quality of life after six months; 5.5 mean difference in physical component of Short Form-12; 6.0 mean difference in mental component of Short Form-12

1) Compared to control.

Source: Population Health Advisor research and analysis.

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How to succeed

To effectively deploy self-management mobile applications:

- Prioritize disease management basics (e.g., self-management education) before incorporating new technologies in patient care
- Include the mobile app in care plan development to ensure that staff and patient have a shared understanding of the role of the app and how it will fit into the patient's day-to-day life
- Plan for a minimum rate of patient-care team interaction via the mobile app of once per week, since studies show that more frequent engagement improves symptom management
- Implement strict quality controls when selecting mobile apps to make sure apps employ validated and evidence-based techniques, intuitive design, customization, and strict security features to protect patient health information
- Allow clinicians to "prescribe" digital tools to patients by embedding curated apps into workflows that push appropriate content based on patient conditions, payer type, and commercial health plan

To learn more about developing an evidence-based approach, check out our blog post "Are patient-management apps a 'magic bullet' for chronic disease management? Not quite yet" here. Then read our blog post "Investing in behavioral health mobile apps? Keep these 3 things in mind" here.

Demonstrated impact

Literature review summary

Title: The Effectiveness of Self-Management Mobile Phone and Tablet Apps in Long-Term Condition Management: A Systematic Review
Publication: Journal of Medical Internet Research
Date: 2016
Type: Systematic review
Study population: Patients who used self-management mobile and tablet apps to improve symptoms of long-term conditions (e.g., diabetes, cardiovascular diseases, chronic lung diseases) across 9 randomized controlled trials in Europe, Oceania, Asia, and the United States
Major findings:

- Mixed impact on hospitalizations (insignificant to 0.84 fewer hospitalizations per patient per year compared to control)
- Fewer unscheduled visits (0.95 fewer visits per patient per year)
- Mixed impact on HbA1c reduction compared to control group for patients with diabetes (insignificant to 1.39 percentage point decrease)
- Mixed impact on asthma control for patients with poorly controlled or moderate-to-severe persistent asthma
    - Increased expiratory flow rate (37 L/min greater improvement than control)
    - Increased forced expiratory volume (9 percentage point greater improvement than control)
    - Insignificant change in patient scores on questionnaires assessing patients' control, knowledge, attitude, and self-efficacy regarding asthma care
- Mixed impacts on adherence to care plan (5 percentage points lower to 33 percentage points higher than control; 50% to 70% of intervention group adhered to protocol)
- Wide range of attrition rates (9-32%)
- Mixed impact on quality of life (insignificant to 17 percentage point increased score on SF-12 compared to control)
- Insignificant impact on hospital length of stay, patient-reported diabetes distress, BMI for patients with type 2 diabetes, depression, diabetes symptoms, blood pressure, self-efficacy, and self-care activities

Cost of self-management application interventions and attrition rates varied widely ($8-108 and 9-32%, respectively).
Source: Full article here.

Source: Population Health Advisor research and analysis.

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Title: Technology-Enabled Consumer Engagement: Promising Practices at Four Health Care Delivery Organizations
Publication: Health Affairs
Date: 2019
Type: Case study compilation
Study population: Patients treated at Ochsner Health System, Sutter Health, Stanford Health Care, and UC San Diego Health who used self-management apps
Major findings: Compared to control, use of a self-management app resulted in:
- Fewer primary care visits (29 percentage points)
- Increased blood pressure control (53 percentage points)
- Greater reduction in HbA1c (0.66 percentage points)
- More blood pressure measurements in the EHR (91.4 percentage points)
- Increased medication adherence (12 percentage points)

Source: Full article here.

Title: Computer and Mobile Technology Interventions for Self-Management in Chronic Obstructive Pulmonary Disease (Review)
Publication: Cochrane Database of Systematic Reviews
Date: 2017
Type: Systematic review
Study population: 1,580 patients diagnosed with COPD across three randomized controlled trials including patients from the United States, Puerto Rico, and the Netherlands
Major findings: Intervention included self-management smart technology while control group included face-to-face or written educational support. Use of self-management smart technology resulted in:
- Increased physical activity (864 increase in step count)
- Improved health-related quality of life after four weeks to six months (0.15-0.32 standard mean difference) but results were insignificant at 12 months
- Insignificant impact on hospitalizations, exacerbations of COPD, and smoking cessation rates

Source: Full article here.

Title: Smartphone and Tablet Self-Management Apps for Asthma (Review)
Publication: Cochrane Database of Systematic Reviews
Date: 2013
Type: Systematic review
Study population: 408 patients in Taiwan and the United Kingdom diagnosed with asthma across two randomized controlled trials
Major findings: Compared to control, use of self-management apps resulted in:
- Insignificant impact on hospitalizations
- Insignificant impact to 17% decreased odds of ED visit
- Improved lung function at six months
    - 39.2 mean difference increased peak expiratory flow rate
    - 8.70 mean difference increased forced expiratory volume
- Insignificant impact to 5.5 standard mean difference increase in the physical component and 6.0 standard mean difference increase in mental component of the SF-12 questionnaire evaluating asthma-related quality of life
- Insignificant impact on adherence to intervention, occurrence of asthma-related complications, and asthma symptom scores

Source: Full article here.

Source: Population Health Advisor research and analysis.

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Appendix

- Whitehead L, et al., "The Effectiveness of Self-Management Mobile Phone and Tablet Apps in Long-Term Condition Management: A Systematic Review," *Journal of Medical Internet Research*, 18, no. 5 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4886099/.
- Tai-Seale M, et al., "Technology-Enabled Consumer Engagement: Promising Practices at Four Health Care Delivery Organizations," *Health Affairs,* 38, no. 3 (2019), https://www.healthaffairs.org/doi/abs/10.1377/hlthaff.2018.05027?journalCode=hlthaff.
- McCabe C, et al., "Computer and Mobile Technology Interventions for Self-Management in Chronic Obstructive Pulmonary Disease (Review)," *Cochrane Database of Systematic Reviews,* 23, no. 5 (2017), https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD011425.pub2/epdf/full.
- Marcano Belisario JS, et al., "Smartphone and Tablet Self-Management Apps for Asthma (Review)," *Cochrane Database of Systematic Reviews,* 27, no. 11 (2013), https://www.ncbi.nlm.nih.gov/pubmed/24282112.

Source: Population Health Advisor research and analysis.