ECONOMIC IMPACT OF VIRTUAL MONITORING CHRONIC DISEASES

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Please find following a summary of a literature search and relevant results. All articles can be provided in full - email library@monashhealth.org for a list of the articles you require.

QUESTION

What the health economic impact/ benefits of implementation of virtual monitoring systems for chronic health conditions?

RESULTS

ONLINE RESOURCES (GREY LITERATURE)

GUIDELINES

NSW Government Agency for Clinical Innovation. (2024). **Remote Patient Monitoring Evidence Check.** Link.

- Cost Effectiveness (pg. 6).
  - Found to be cost effective in longer term
  - Associated with fewer emergency attendances and admissions
  - Cost utility analysis found increased costs but better quality of life.

Centers for Disease Control and Prevention (2024). **Evidence of Impact for Telehealth.** Link.

- Programs that implement telehealth can be cost-effective, through cost savings for patients as well as through reduced health care utilization. Removing barriers to care will likely lead to increased use of telehealth interventions and programs, which may be cost-effective but still result in higher short-term costs. Additional and rigorous economic studies assessing the long-term cost savings and effectiveness are needed to support economic impact of telehealth.

McMaster Health Forum. (2022). **Rapid Synthesis: Identifying remote-monitoring technologies to enable existing level of care 60-day response.** Link.

- Findings (pg. 3).
  - Cost outcomes are associated with the eligible population, equipment cost, program preference for disease specific vital signs.
  - Facilitators for remote monitoring include the long term cost effectiveness.
- Patient perceptions and cost effectiveness (pg. 11).
  - Monitoring a single vital sign is more cost effective than multiple vital signs.
  - Remote-monitoring programs may be more cost effective for specific chronic conditions.

HEALTH TECHNOLOGY ASSESSMENTS

National Institute for Health and Care Excellence. (2024). **Devices for remote monitoring of Parkinson's disease: A systematic review and cost-effectiveness analysis.** Link.
The cost-effectiveness of remote monitoring appears to be largely unfavourable with incremental cost-effectiveness ratios in excess of £30,000 per quality-adjusted life-year across a range of alternative assumptions. The main driver of cost-effectiveness was the durability of improvements in patient symptoms.

Agency for Healthcare Research and Quality (AHQR). (2021). **Automated-entry patient-generated health data for chronic conditions: The Evidence on Health Outcomes.** Link.
Cost outcomes for each disease investigated; obesity, diabetes prevention, sleep apnea, hypertension, coronary heart disease, heart failure, cardiac arrythmias, stroke, parkinson's disease, chronic obstructive pulmonary disease and asthma. Cost effectiveness depends on type of disease and type of monitoring device used.

ONGOING RESEARCH

Leow. M, et al.(2024). **Remote Patient Monitoring Solution for Chronic Respiratory Disease Management.** *ClinicalTirals.gov.* Link.
Using a randomized controlled trial design, this project aims evaluate the effectiveness of AeviceMD in improving patients' outcomes in terms of reducing exacerbation, healthcare utilization, improving quality of life, self-efficacy, and cost effectiveness. Paediatric patients above age 7 and adults will be recruited. The data follow-up period is 3 months. It will also evaluate the usability of the device from both patients' and clinicians' perspective.

Ballreich. J, et al. (2022). **Are Mhealth Interventions to Prevent Diabetes Cost-Effective? a Systematic Review.** *Value in health, 25*(7): s534. Link.
Our results suggest there is limited evidence demonstrating the value of mHealth interventions for people with prediabetes. The growing popularity of mHealth interventions across chronic conditions including prediabetes should warrant additional economic evaluations to facilitate stakeholders' assessment of their value prior to widespread adoption.

Rinaldi. G, et al. (2019). **Cost and cost-effectiveness of mHealth interventions for the prevention and control of type 2 diabetes mellitus: a protocol for a systematic review.** *BMJ Open, 9*: e027490. Link.
Type 2 diabetes mellitus (T2DM) remains one of the most common chronic diseases of adulthood which creates high degrees of morbidity and mortality worldwide. The incidence of T2DM continues to rise and recently, mHealth interventions have been increasingly used in the prevention, monitoring and management of T2DM. The aim of this study is to systematically review the published evidence on cost and cost-effectiveness of mHealth interventions for T2DM, as well as assess the quality of reporting of the evidence

PEER-REVIEWED LITERATURE – MOST RECENT FIRST

Articles are grouped by theme:

- Cost effective outcomes

- Mixed outcomes
- No cost effective outcomes

Each article summary contains excerpts from the abstract and an online link.

COST EFFECTIVE OUTCOMES

Maida. E, et al. (2024). **Cost-Analysis of Telemedicine Interventions Compared with Traditional Care in the Management of Chronic Neurological Diseases: A Systematic Review.** *Telemedicine journal and e-health, 30*(2):404-414. Request article.
Cost-analysis showed an overall benefit in terms of both cost and effectiveness from the application of telemedicine instead of in-presence management in Chronic Neurological Diseases. Among the identified interventions, digital Cognitive Behavioural Therapy proved to be the most cost-saving. However, promising results were also found in monitoring and assessment devices and in telerehabilitation.

Oh. K, et al. (2024). **Information and Communications Technology-Based Monitoring Service for Tailored Chronic Disease Management in Primary Care: Cost-Effectiveness Analysis Based on ICT-CM Trial Results**. *Journal of Medical Internet Research 26*: e51239. Full text.
Information and communications technology-based tailored management (TM) intervention is a novel automatic system in which a smartphone app for the management of patients with hypertension and diabetes, the provider web, and Bluetooth devices are linked. Compared with UC, TM intervention is a cost-effective option for patients with hypertension or diabetes in primary care settings. The study results can assist policy makers in making evidence-based decisions when implementing accessible chronic disease management service.

Whitehead. D, et al. (2023). **The Next Frontier of Remote Patient Monitoring: Hospital at Home**. *Journal of medical Internet research, 25*(100959882):e42335. Full text.
Remote patient monitoring (RPM) has shown promise in aiding safe and efficient remote care for chronic conditions; however, its use remains more limited within the hospital at home (HaH) model of care despite a significant opportunity to increase patient eligibility, improve safety, and decrease costs. Overall, RPM holds great promise to increase patient eligibility and patient safety while decreasing costs.

Carter. H, et al. (2023). **Economic evaluation of an integrated virtual care programme for people with chronic illness who are frequent users of health services in Australia.** *BMJ open, 13*(4):e066016. Full text.
The MeCare programme is a tailored virtual care initiative targeted at frequent users of health services who have at least one chronic condition including cardiovascular disease, chronic respiratory disease, diabetes or chronic kidney disease. The programme aims to prevent unnecessary hospitalisations by helping patients to self-manage, improve their health literacy and engage in positive health behaviours. The MeCare programme is likely to result in substantial cost savings to the health system, while maintaining or improving patient-reported outcomes.

De Jong. M, et al. (2020). **Cost-effectiveness of Telemedicine-directed Specialized vs Standard Care for Patients With Inflammatory Bowel Diseases in a Randomized Trial.** *Gastroenterological Association, 8*(8):1744-1752. Full text.

Telemedicine can be used to monitor determinants and outcomes of patients with chronic diseases, possibly increasing the quality and value of care. Telemedicine was found to reduce outpatient visits and hospital admissions for patients with inflammatory bowel diseases (IBD). We performed a full economic evaluation of telemedicine interventions in patients with IBD, comparing the cost-utility of telemedicine vs standard care. Telemedicine with myIBDcoach is cost saving and has a high probability of being cost effective for patients with IBD. This self-management tool enables continuous registration of quality indicators and (patient-reported) outcomes and might help reorganize IBD care toward value-based healthcare.

Milan Manani. S, et al. (2019). **Remote Patient Management in Peritoneal Dialysis Improves Clinical Outcomes.** *Contributions to nephrology, 197*: 124-132. Full text.

In our experience, matured over 2 years in a cohort of prevalent patients, we observed a significant reduction of patient drop-out and technique failure, the number of scheduled and unscheduled hospital visits, the number of episodes of overhydration, rate of hospitalization, episodes of non-compliance to prescription, patient and hospital team time spent in travelling and management of therapy, healthcare costs and patient's expenditure, miles travelled by patients from home to hospital and vice versa. The cost/benefit analysis is strongly in favour of the RPM-APD modality versus the traditional periodic hospital visit regime.

MIXED OUTCOMES

Sten-Gahmberg. S, et al. (2024**). Pragmatic randomized controlled trial comparing a complex telemedicine-based intervention with usual care in patients with chronic conditions.** *The European journal of health economics, 25*(7): 1275-1289. Full text.
This study evaluates a complex telemedicine-based intervention targeting patients with chronic health problems. Computer tablets and home telemonitoring devices are used by patients to report point-of-care measurements, e.g., blood pressure, blood glucose or oxygen saturation, and to answer health-related questions at a follow-up center. The cost-benefit of the intervention depends largely on the design of the service and the value society places on improved safety and self-efficacy.

Bohingamu Mudiyanselage. S, et al. (2023). **Cost-effectiveness of personalised telehealth intervention for chronic disease management: A pilot randomised controlled trial.** *PloS One, 18*(6): e0286533. Full text.
Benefits of PHC to patients and the health system at 12 months translated to a gain in quality-adjusted life years with a non-significant cost difference between the intervention and control groups. Given the relatively high set-up costs of the PHC intervention, the program may need to be offered to a larger population to achieve cost-effectiveness. Long-term follow-up is required to assess the real health and economic benefits over time.

De Guzman. K, et al. (2022). **Economic Evaluations of Remote Patient Monitoring for Chronic Disease: A Systematic Review.** *Research, 25*(6):897-913. Full text.
Remote Patient Monitoring was highly cost-effective for hypertension and may achieve greater long-term cost savings from the prevention of high-cost health events. For chronic obstructive pulmonary disease and heart failure, cost-effectiveness findings differed according to disease severity and there was limited economic evidence for diabetes interventions.

Chua. V, et al. (2022). **The Willingness to Pay for Telemedicine Among Patients With Chronic Diseases: Systematic Review.** *Journal of medical Internet research, 24*(4): e33372. Full text.
Telemedicine is increasingly being leveraged, as the need for remote access to health care has been driven by the rising chronic disease incidence and the COVID-19 pandemic. It is also important to understand patients' willingness to pay (WTP) for telemedicine and the factors contributing toward it, as this knowledge may inform health policy planning processes, such as resource allocation or the development of a pricing strategy for telemedicine services. There is limited exploration of the WTP from a patient's perspective, despite it being pertinent to the sustainability of telemedicine interventions. On the basis of our findings, the following are recommendations that may enhance the WTP: exposure to the telemedicine intervention before assessing the WTP, the lowering of telemedicine costs, and the provision of patient education to raise awareness on telemedicine's benefits and address patients' concerns.

Eze. N, et al. (2020). **Telemedicine in the OECD: An umbrella review of clinical and cost-effectiveness, patient experience and implementation.** *PloS One, 15*(8): e0237585. Full text.
This umbrella review finds that telemedicine interventions can improve glycemic control in diabetic patients; reduce mortality and hospitalization due to chronic heart failure; help patients manage pain and increase their physical activity; improve mental health, diet quality and nutrition; and reduce exacerbations associated with respiratory diseases like asthma. In certain disease and specialty areas, telemedicine may be a less effective way to deliver care. While there is evidence that telemedicine can be cost-effective, generalizability is hindered by poor quality and reporting standards. This umbrella review also finds that patients report high levels of acceptance and satisfaction with telemedicine interventions, but that important barriers to wider use remain.

NO COST EFFECTIVE OUTCOMES

Miranda. R. N, et al. (2022). **An Electronic Patient-Reported Outcomes Tool for Older Adults With Complex Chronic Conditions: Cost-Utility Analysis.** *JMIR Aging, 5*(2): e35075. Full text.
The ePRO tool is not a cost-effective technology at the commonly used WTP value of CAD $50,000 (~US $40,000)/QALY, but long-term and the societal impacts of ePRO were not included in this analysis. Further research is needed to better understand its impact on long-term outcomes and in real-world settings. The present findings add to the growing evidence about eHealth interventions' capacity to respond to complex aging populations within finite-resourced health systems.

Waller. K, et al. (2023). **Economic evaluation of a mobile phone text-message intervention for Australian adults with type 2 diabetes.** *MHealth 9*: 12. Full text.
This study aimed to determine the cost-effectiveness and cost-utility of a 6-month text-message intervention (DTEXT) to improve glycated hemoglobin (HbA1c) and self-management behaviors for Australian adults with type 2 diabetes. DTEXT was low cost and potentially scalable, but only had a low to moderate probability of being effective and cost saving. Further research should determine more targeted approaches that may improve cost-effectiveness.

APPENDIX

SEARCH METHODOLOGY

A systematic search was conducted for literature which was screened in Covidence.

SEARCH LIMITS

- English-language
- Published within the last 5 years

DATABASES SEARCHED

- Medline – index of peer reviewed articles across health sciences and medicine.
- Embase – index of biomed and pharmacological peer reviewed journal articles.
- Emcare – index of nursing, allied health, critical-care medicine and more.
- Grey literature – Google, Google Scholar, Trip database, Biomed Central Proceedings.

SEARCH TERMS

Concept	MeSH headings	Keywords
virtual Monitoring	Wearable Electronic Devices, Telehealth	Virtual care, remote care, home care, virtual monitoring, remote monitoring, home monitoring, wearable device system, sms, text, telehealth, wearable, apps,
Chronic Disease	Chronic Disease	Chronic illness, chronic disease, chronic condition, chronic heart failure, chronic respiratory, diabetes
Economic Impact	Costs and Cost Analysis, Cost-Benefit Analysis	Cost analysis, cost evaluation, cost assessment, cost benefit, economic analysis, economic evaluation, economic assessment, economic benefit

MEDLINE SEARCH STRATEGY

Ovid MEDLINE(R) ALL <1946 to November 06, 2024>

1	Wearable Electronic Devices/ or Telehealth/	51711
2	((virtual or remote or home or wearable device) adj (care or monitor* or system*)).tw.	30981
3	(sms or text* or telehealth or wearable).tw.	288779
4	((app or apps or application or applications) adj2 health).tw.	136
5	1 or 2 or 3 or 4	350100
6	Chronic Disease/	288282
7	(chronic adj2 (illness* or disease* or condition* or heart failure or respiratory or diabet*)).tw.	133587
8	6 or 7	391300
9	*"Costs and Cost Analysis"/ or *Cost-Benefit Analysis/	18758
10	((cost* or economic*) adj3 (analys* or evaluat* or assess* or benefit*)).tw.	93558
11	9 or 10	104694
12	5 and 8 and 11	170
13	limit 12 to (english and last 5 years)	64

PRISMA CHART