

Asynchronous and Synchronous Teleconsultation for Diabetes Care: A Systematic Literature Review

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Abstract

Aim:

A systematic literature review, covering publications from 1994 to 2009, was carried out to determine the effects of teleconsultation regarding clinical, behavioral, and care coordination outcomes of diabetes care compared to usual care. Two types of teleconsultation were distinguished: (1) asynchronous teleconsultation for monitoring and delivering feedback via email and cell phone, automated messaging systems, or other equipment without face-to-face contact; and (2) synchronous teleconsultation that involves real-time, face-to-face contact (image and voice) via videoconferencing equipment (television, digital camera, webcam, videophone, etc.) to connect caregivers and one or more patients simultaneously, e.g., for the purpose of education.

Methods:

Electronic databases were searched for relevant publications about asynchronous and synchronous teleconsultation [Medline, Picarta, Psycinfo, ScienceDirect, Telemedicine Information Exchange, Institute for Scientific Information Web of Science, Google Scholar]. Reference lists of identified publications were hand searched. The contribution to diabetes care was examined for clinical outcomes [e.g., hemoglobin A1c (HbA1c), dietary values, blood pressure, quality of life], for behavioral outcomes (patient-caregiver interaction, self-care), and for care coordination outcomes (usability of technology, cost-effectiveness, transparency of guidelines, equity of access to care). Randomized controlled trials with HbA1c as an outcome were pooled using standard meta-analytical methods.

Results:

Of 2060 publications identified, 90 met inclusion criteria for electronic communication between (groups of) caregivers and patients with type 1 and 2 or gestational diabetes. Studies that evaluated teleconsultation not particularly aimed at diabetes were excluded, as were those that described interventions aimed solely at clinical improvements (e.g., HbA1c or lipid profiles).

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Abbreviations: (DQOL) Diabetes Quality of Life, (GP) general practitioner, (HbA1c) hemoglobin A1c, (ICT) information communication technology, (PC) personal computer, (PDA) personal digital assistant, (RCT) randomized controlled trial, (SMS) short message service, (WMD) weighted mean difference

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Abstract cont.

In 63 of 90 interventions, the interaction had an asynchronous teleconsultation character, in 18 cases interaction was synchronously (videoconferencing), and 9 involved a combination of synchronous with asynchronous interaction. Most of the reported improvements concerned clinical values ($n = 49$), self-care ($n = 46$), and satisfaction with technology ($n = 43$). A minority of studies demonstrated improvements in patient-caregiver interactions ($n = 28$) and cost reductions ($n = 27$). Only a few studies reported enhanced quality of life ($n = 12$), transparency of health care ($n = 7$), and improved equity in care delivery ($n = 4$). Asynchronous and synchronous applications appeared to differ in the type of contribution they made to diabetes care compared to usual care: asynchronous applications were more successful in improving clinical values and self-care, whereas synchronous applications led to relatively high usability of technology and cost reduction in terms of lower travel costs for both patients and care providers and reduced unscheduled visits compared to usual care. The combined applications ($n = 9$) scored best according to quality of life (22.2%). No differences between synchronous and asynchronous teleconsultation could be observed regarding the positive effect of technology on the quality of patient-provider interaction. Both types of applications resulted in intensified contact and increased frequency of transmission of clinical values with respect to usual care. Fifteen of the studies contained HbA1c data that permitted pooling. There was significant statistical heterogeneity among the pooled randomized controlled trials ($\chi^2 = 96.46$, $P < 0.001$). The pooled reduction in HbA1c was not statically significant (weighted mean difference -0.10 ; 95% confidence interval -0.39 to 0.18).

Conclusion:

The included studies suggest that both synchronous and asynchronous teleconsultations for diabetes care are feasible, cost-effective, and reliable. However, it should be noted that many of the included studies showed no significant differences between control (usual care) and intervention groups. This might be due to the diversity and lack of quality in study designs (e.g., inaccurate or incompletely reported sample size calculations). Future research needs quasi-experimental study designs and a holistic approach that focuses on multilevel determinants (clinical, behavioral, and care coordination) to promote self-care and proactive collaborations between health care professionals and patients to manage diabetes care. Also, a participatory design approach is needed in which target users are involved in the development of cost-effective and personalized interventions. Currently, too often technology is developed within the scope of the existing structures of the health care system. Including patients as part of the design team stimulates and enables designers to think differently, unconventionally, or from a new perspective, leading to applications that are better tailored to patients' needs.

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