SPMC JHCS

BRIEF REPORT

Effectiveness of telemedicine on clinical and psychosocial outcomes of adults with non-communicable diseases: literature review

Mark Angelo Andrada,[1] Paul Romeo Colendres,[2] Daisy Wu[3]

[1]Professional Education, Training, and Development, Southern Philippines Medical Center, JP Laurel Ave, Davao City, Philippines
[2]Acute Surgical Unit, Southern Philippines Medical Center, JP Laurel Ave, Davao City, Philippines
[3]Geriatric Facility, DrieGasthuizenGroep, Netherlands

Correspondence
Mark Angelo Andrada,
markandrada123@gmail.com

Received
4 June 2021

Accepted
21 December 2022

Published online
29 December 2022

Cite as
Andrada MA, Colendres PR, Wu D. Effectiveness of telemedicine on clinical and psychosocial outcomes of adults with non-communicable diseases: literature review. *SPMC J Health Care Serv.* 2022;8(2):8. http://n2t.net/ark:/76951/jhcs3vm9u4

The prevalence of non-communicable diseases (NCDs) across the globe has reached epidemic proportions, with more than three quarters of NCD deaths now occurring in low- and middle-income countries (LMIC).[1] NCDs encompass a broad range of chronic conditions, which include cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, and mental disorders.[2] To mitigate the growing global NCD burden and its associated challenges, upscaling high-impact essential interventions for the prevention and control of NCDs has remained a priority, especially in low-resource settings. One such intervention is strengthening self-care strategies or self-management of individuals living with NCDs.[3]

In the past few decades, the self-management approach to NCD has proven to be a cost-effective strategy to improve a patient's quality of life by reducing symptom severity and decreasing pain. This approach has also encouraged patients to become key decision makers in the treatment process.[4] Self-management includes both technological (e.g. smartphone applications, telemonitoring systems, or wearable devices) and non-technological interventions (social support, educational materials, or in-person training seminars).[5]

Telemedicine has played several important roles in the whole spectrum of care for patients with NCD. These include promotion of healthy behaviors, prevention of risk factors, prompt recognition and initiation of treatment, disease monitoring and follow-up, rehabilitation, and palliation. Telemedicine not only increases access to health care but also improves the quality of health care especially in rural areas.[6 7]

The unique challenges resulting from the COVID-19 pandemic has limited patient access to health care, especially in geographically isolated and disadvantaged areas. This literature review aims to determine the effectiveness of telemedicine on clinical and psychosocial outcomes of adult patients diagnosed with NCDs.

We conducted a literature search on PubMed, EBSCOhost, ProQuest, Google Scholar, and Gale using the search words "telemedicine," "adult," "non-communicable disease," "self-management," and "teleconsultation." We filtered the results to only include randomized controlled trials (RCT).

To narrow down the scope of this literature review, only previous studies that compared telemedicine and usual care (non-telemedicine) among adults with non-communicable diseases, and those that report clinical and psychosocial outcomes—i.e., symptom outcomes, laboratory outcomes, knowledge on disease, or behavior outcomes that pertain to self-management of disease—were assessed. We excluded studies if they were done among patients <18 years old, if they included telemedicine that supplemented rather than replaced the usual (face-to-face) care, if they were not able to report outcomes between groups, or if they did not meet the criteria of a RCT.

Two reviewers independently reviewed the abstracts yielded from the search strategy and assessed them based on the set criteria. If neither reviewer was able to rule out an article based on the abstract, the full text was retrieved and assessed to determine inclusion into the study. After the final assessment, a total of 9 RCT reports were included in this review.

The general characteristics and key findings of the 9 studies included in this literature review are summarized in Table 1. The included studies, published in various journals between 2014 and 2021, were carried out in eight countries—two studies were done in Australia, and one each in Bangladesh, India, Italy, USA, Germany, China, and the Netherlands. The studies enrolled patients who were diagnosed with type 2 diabetes mellitus (DM) (n=3), chronic obstructive pulmonary disease (n=1), type 1 DM (n=1), congestive heart failure (n=1), stroke (n=1), osteoarthritis (n=1), and various non-specific chronic conditions, including type 2 DM, hypertension, coronary artery diseases, heart failure, chronic depression, and schizophrenia (n=1). The

Table 1 Characteristics and findings of included studies

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
Yasmin, et al.[8] (2020, Bangladesh)	320 patients with type 2 diabetes mellitus (DM) at an outpatient clinic	**Treatment:** mobile phone-based health reminders every 10 days and free 24/7 access to call center services for 3 months (mobile phone reminder group) **Control:** no reminders, regular hospital services, for 3 months (no reminder group)	a. adherence to medication intake	a. patients in the mobile phone reminder group did not significantly differ from those in the no reminder group in terms of adherence to medication intake
			b. adherence to changes in lifestyle (diet, physical exercises, and tobacco and/or betel nut use)	b. compared to patients in the no reminder group, those in the mobile phone reminder group had significantly greater odds of adhering to their diet (adjusted OR 4.00; 95% CI 2.34 to 6.83; p<0.001), doing physical exercise (adjusted OR 3.07; 95% CI 1.52 to 6.19; p=0.002), and ceasing tobacco and/or betel nut use (adjusted OR 5.75; 95% CI 2.70 to 12.21; p<0.001)
			c. glycemic control	c. patients in the mobile phone reminder group had significantly greater odds of achieving blood glycemic control than those in the no reminder group (adjusted OR 3.1; 95% CI 1.81 to 5.30; p<0.001)
Muralidharan, et al.[9] (2019, India)	561 smartphone users who are at high risk for type 2 DM recruited in parks, residential colonies, and corporates, and through direct clinic referrals	**Treatment:** use of a mobile phone app that contains video lessons and interactive texts, and/or weekly coach calls for 3-4 months (mobile phone group) **Control:** face-to-face counseling with a nutritionist for 3-4 months (face-to-face counseling group)	a. weight loss	a1. the mobile phone group had significantly greater mean weight loss after 12 weeks compared to the face-to-face counseling group (1.1 kg vs 0.3 kg, p<0.05)
				a2. those who used the app alone had significantly greater mean weight loss compared to those who only attended coach calls (2.4 kg vs 0.8 kg, p<0.01)
Ding, et al.[10] (2020, Australia)	184 patients with congestive heart failure (CHF) from two hospitals	**Treatment:** remote body weight monitoring (electronic scale connected via bluetooth to an app in the computer tablet that alerts the project nurses to take the necessary course of action based on weight fluctuations) and structured support through telephone for 6 months (remote monitoring group) **Control:** use of a paper-based diary to monitor weight and a CHF booklet, and usual care for 6 months (paper-based monitoring group)	a. compliance with weight monitoring for at least 4 times a week, and for at least 6 times a week (intention-to-treat analysis)	a1. in the intention-to-treat analysis, the proportions of participants who were compliant with weight monitoring for at least 4 times a week were not significantly different between the remote monitoring group and the paper-based monitoring group (74% vs 60%, respectively; p=0.06)
				a2. in the intention-to-treat analysis, the proportion of participants who were compliant with weight monitoring for at least 6 times a week was significantly greater in the remote monitoring group compared to that in the paper-based monitoring group (45% vs 25%; p=0.005)
			b. compliance with weight monitoring for at least 4 times a week, and for at least 6 times a week (per protocol analysis)	b1. in the per protocol analysis, the proportion of participants who were compliant with weight monitoring for at least 4 times a week was significantly greater in the remote monitoring group compared to that in the paper-based monitoring group (97% vs 67%, p<0.01)
				b2. in the per protocol analysis, the proportion of participants who were compliant with weight monitoring for at least 6 times a week was significantly greater in the remote monitoring group compared to that in the paper-based monitoring group (61% vs 28%, p<0.01)
			c. mean change in Heart Failure Compliance Questionnaire (HFCQ) score (higher=better; lower=worse) from baseline to 6 months for health maintenance, medications, diet, exercise, smoking, and alcohol use (greater change value=better; lesser change value=worse)	c1. the remote monitoring group had significantly better improvement in HFCQ score for health maintenance at 6 months than the paper-based monitoring group (mean change 0.06 ± 0.49 vs -0.20 ± 1.03; p=0.04)
				c2. the remote monitoring group had significantly better improvement in HFCQ score for medications at 6 months than the paper-based monitoring group (mean change 0.08 ± 0.54 vs -0.04 ± 0.87; p=0.05)

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
				c3. the remote monitoring group had significantly better improvement in HFCQ score for diet at 6 months than the paper-based monitoring group (mean change 0.35 ± 1.05 vs -0.01 ± 1.07; p=0.008)
				c4. after 6 months, the changes in HFCQ scores for exercise in the remote monitoring group and in the paper-based monitoring group did not significantly differ from each other (mean change -0.03 ± 1.02 vs -0.21 ± 1.06, respectively; p=0.10)
				c5. after 6 months, the changes in HFCQ scores for smoking in the remote monitoring group and in the paper-based monitoring group did not significantly differ (mean change -0.14 ± 1.51 vs -0.11 ± 1.14, respectively; p=0.48)
				c6. after 6 months, the changes in HFCQ scores for alcohol use in the remote monitoring group and in the paper-based monitoring group did not significantly differ from each other (mean change -0.06 ± 1.19 vs 0.02 ± 1.15, respectively; p=0.32)
Bertuzzi, et al.[11] (2018, Italy)	74 patients with type 1 DM from two diabetes center	**Treatment:** teleconsultation with a diabetologist every four months plus access to web educational courses and a nutritional or psychological counseling for 12 months (remote consultation group) **Control:** standard scheduled visits every four months in an outpatient clinic for 12 months (standard visit group)	a. mean change in hemoglobin A1C (HbA1c) test from baseline to 12 months	a. the mean change in HbA1c values from baseline to 12 months between the remote consultation group and standard visit group had no significant difference (-0.8 mmol/mol ± 7.4 vs -1.9 ± 9.0 mmol/mol, respectively; p=0.60)
			b. incidence of severe hypoglycemic episodes	b. the incidence of severe hypoglycemic episodes was significantly lower in the remote consultation group compared to that in the standard visit group (0% vs 5%; p=0.03)
Hinman, et al.[12] (2020, Australia)	175 community volunteers with osteoarthritis	**Treatment:** exercise advice and support (5–10 consultations with a physiotherapist trained in behavior change for a personalized strengthening and physical activity program for 6 months) plus the existing telephone service for 12 months (exercise advice group) **Control:** existing telephone service (≥1 nurse consultation for self-management advice) for 12 months (existing telephone service group)	a. mean change in overall knee pain score (numerical rating scale; higher=worse; lower=better) from baseline to 6 months and to 12 months (greater change value=better; lesser change value=worse)	a1. after 6 months, the changes in overall knee pain scores in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change 2.5 ± 2.0 vs 1.9 ± 2.3, respectively; p=0.057)
				a2. after 12 months, the changes in overall knee pain scores in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change 2.1 ± 2.2 vs 1.8 ± 2.4, respectively; p=0.44)
			b. mean change in physical function score using the Western Ontario and McMaster Universities Osteoarthritis Index (higher=worse; lower=better) from baseline to 6 months and to 12 months (greater change value=better; lesser change value=worse)	b1. the exercise advice group had significantly better improvement in physical function score at 6 months than the existing telephone service group (mean change 10.8 ± 9.2 vs 5.8 ± 10.5; p=0.013)
				b2. after 12 months, the changes in physical function scores in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change 11.1 ± 9.8 vs 7.8 ± 11.0, respectively; p=0.097)

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
			c. mean change in knee pain on daily activities score using the Western Ontario and McMaster Universities Osteoarthritis Index (higher=worse; lower=better) from baseline to 6 months and to 12 months (greater change value=better; lesser change value=worse)	c1. the exercise advice group had significantly better improvement in knee pain on daily activities score at 6 months than the existing telephone service group (mean change 3.0 ± 2.5 vs 1.7 ± 3.1; p=0.014)
				c2. after 12 months, the changes in knee pain on daily activities scores in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change 2.9 ± 2.9 vs 2.0 ± 3.0, respectively; p=0.11)
			d. mean change in average pain on walking (numerical rating scale; higher=worse; lower=better) at 6 months and 12 months (greater change value=better; lesser change value=worse)	d1. the mean change in average pain on walking at 6 months in the exercise advice group was significantly better than in the existing telephone service group (2.3 ± 2.5 vs 1.2 ± 2.6; p=0.023)
				d2. after 12 months, the changes in average pain on walking in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change 2.0 ± 2.3 vs 1.7 ± 2.4, respectively; p=0.59)
			e. mean change in self-efficacy for pain (arthritis self-efficacy scale; higher=better; lower=worse) at 6 months and 12 months (greater change value=worse; lesser change value=better)	e1. the mean change in self-efficacy for pain at 6 months in the exercise advice group was significantly better than in the existing telephone service group (-1.4 ± 2.1 vs -0.3 ± 2.3; p<0.001)
				e2. the mean change in self-efficacy for pain at 12 months in the exercise advice group was significantly better than in the existing telephone service group (-1.4 ± 2.0 vs -0.5 ± 2.5; p<0.001)
			f. mean change in self-efficacy for function (arthritis self-efficacy scale; higher=better; lower=worse) at 6 months and 12 months (greater change value=worse; lesser change value=better)	f1. after 6 months, the changes in self-efficacy for function in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change -0.8 ± 1.5 vs -0.6 ± 1.7, respectively; p=0.25)
				f2. after 12 months, the changes in self-efficacy for function in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change -0.8 ± 1.6 vs -0.6 ± 1.6, respectively; p=0.39)
			g. mean change in physical activity using the Physical Activity Scale for the Elderly (higher=better; lower=worse) at 6 months and 12 months (greater change value=worse; lesser change value=better)	g1. after 6 months, the changes in physical activity in the exercise advice group and in the existing telephone service group did not significantly differ from each other (mean change -20 ± 75 vs -11 ± 85, respectively; p=0.43)
				g2. the mean change in physical activity at 12 months in the exercise advice group was significantly better than the existing telephone service group (-20 ± 97 vs 8 ± 87; p=0.044)
Greenwood, et al.[13] (2015, USA)	90 participants with type 2 DM from a large health care system	**Treatment:** telehealth tablet app-based remote monitoring with paired glucose testing, plus 84 sequential daily health sessions for 6 months (telehealth group)	a. instantaneous linear change (greater instantaneous change=better; lesser instantaneous change=worse) in HbA1c at 6 months	a. the telehealth group had significantly faster instantaneous linear change in HbA1c after 6 months compared to the usual care group (-0.31% vs -0.07%; p=0.005)
		Control: usual care—	b. mean Diabetes Knowledge Test (DKT)	b. the mean DKT scores in the telehealth group and in the usual care group did not significantly differ from each

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
		diabetes education booklets and referral for formal diabetes education—for 6 months (usual care group)	score at 3 months	other (12.1 [9.1-14.0] vs 11.4 [10.1-12.6], respectively; p=0.55)
			c. mean self-management score (higher=better; lower=worse) using the Summary of Diabetes Self-Care Activities Questionnaire at 3 months (general diet, specific diet, carbohydrate spacing, exercise, medication, monitoring blood glucose, foot care)	c1. the mean self-management scores for general diet in the telehealth group and in the usual care group did not significantly differ from each other (4.7 [2.0-7.0] vs 4.9 [3.7-6.1], respectively; p=0.84)
				c2. the mean self-management scores for specific diet in the telehealth group and in the usual care group did not significantly differ from each other (4.6 [1.7-7.0] vs 4.2 [3.0-5.3], respectively; p=0.68)
				c3.the telehealth group had a significantly higher mean self-management score for carbohydrate spacing than the usual care group (4.7 [3.4-7.0] vs 3.9 [2.4-5.4]; p=0.04)
				c4. the mean self-management scores for exercise in the telehealth group and in the usual care group did not significantly differ from each other (3.7 [0.60-6.8] vs 2.6 [1.3-3.9], respectively; p=0.07)
				c5. the mean self-management scores for medication in the telehealth group and in the usual care group did not significantly differ from each other (6.3 [5.2-7.0] vs 6.4 [5.4-7.3], respectively; p=0.34)
				c6. the telehealth group had a significantly higher mean self-management score for monitoring blood glucose than the usual care group (5.1 [2.6-7.0] vs 3.7 [2.1-5.3]; p=0.001)
				c7. the telehealth group had a significantly higher mean self-management score for foot care than the usual care group (5.0 [1.7-7.0] vs 3.8 [2.5-5.2]; p=0.02)
			d. mean self-efficacy score (higher=better; lower=worse) using the Diabetes Empowerment Scale Short Form at 3 months	d. after 3 months, the mean self-efficacy scores in the telehealth group and in the usual care group did not significantly differ from each other (4.1 [2.8-5.3] vs 3.8 [3.2-3.3], respectively; p=0.70)
Dwinger, et al.[14] (2020, Germany)	10,815 invited patients insured at a statutory health insurance	**Treatment:** telephone-based health coaching, consisting of motivational interviewing and shared-decision making counseling strategies for 36 months (telephone-based group) **Control:** usual care (no coaching) for 36 months (usual care group)	a. mean quality of life-mental score at 36 months (intention-to-treat analysis)	a. in the intention-to-treat analysis, the mean quality of life-mental scores in the telephone-based group and in the usual care group did not significantly differ from each other (41.43 ± 6.13 vs. 41.77 ± 6.30, respectively; p=0.173)
			b. mean quality of life-mental score at 36 months (per protocol analysis)	b. in the per protocol analysis, the mean quality of life-mental scores in the telephone-based group and in the usual care group did not significantly differ from each other (41.47 ± 6.12 vs. 41.77 ± 6.30, respectively; p=0.256)
			c. mean quality of life-physical score at 36 months (intention-to-treat analysis)	c. in the intention-to-treat analysis, the mean quality of life-physical scores in the telephone-based group and in the usual care group did not significantly differ from each other (36.02 ± 10.74 vs. 35.77 ± 11.28, respectively; p=0.557)
			d. mean quality of life-physical score at 36 months (per protocol analysis)	d. in the per protocol analysis, the mean quality of life-physical scores in the telephone-based group and in the usual care group did not significantly differ from each other (35.90 ± 10.63 vs. 35.77 ± 11.28, respectively; p=0.772)

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
			e. mean health status score at 36 months (intention-to-treat analysis)	e. in the intention-to-treat analysis, the mean health status scores in the telephone-based group and in the usual care group did not significantly differ from each other (54.82 ± 19.89 vs. 54.32 ± 20.91, respectively; p=0.516)
			f. mean health status score at 36 months (per protocol analysis)	f. in the per protocol analysis, the mean health status scores in the telephone-based group and in the usual care group did not significantly differ from each other (54.93 ± 19.59 vs. 54.32 ± 20.91, respectively; p=0.449)
Yan, et al.[15] (2021, China)	1,299 patients with a history of stroke, recruited from 50 rural villages	**Treatment:** digital health system consisting of an android-based smartphone application linked with a third-party dispatching platform and a message bank, plus monthly follow-up visits to participants for 12 months (digital system group) **Control:** usual care (as needed or quarterly follow-up visits for patients with hypertension and diabetes) for 12 months (usual care group)	a. mean difference in change in systolic blood pressure, adjusted for several covariates, after 12 months (positive value=treatment is worse; negative value=treatment is better)	a. mean difference in change in systolic blood pressure (BP), adjusted for several covariates, after 12 months (positive value=treatment is worse; negative value=treatment is better)
			b. mean difference in change in diastolic BP, adjusted for several covariates, after 12 months (positive value=treatment is worse; negative value=treatment is better)	b. patients in the digital system group had significantly greater reduction in diastolic BP after 12 months compared to the usual care group (adjusted mean difference=−2.34 mm Hg; 95% CI −3.3 to −1.4; p<0.001)
			c. mobility performance using Timed Up and Go test, adjusted for several covariates, after 12 months (RR greater than 1.00=control is better; RR less than 1.00=treatment is better)	c. the digital system group had significantly better mobility performance after 12 months compared to the usual care group (adjusted RR=0.87; 95% CI 0.77-0.98; p=0.022)
			d. mean difference in change in physical activity, measured in metabolic equivalent of task (MET) min/wk, adjusted for several covariates, after 12 months (positive value=treatment is better; negative value=treatment is worse)	d. patients in the digital system group had significantly greater increase in physical activity after 12 months compared to the usual care group (adjusted mean difference=490.2 MET min/wk; 95% CI 244.1 to 736.3; p<0.001)
			e. mean difference in change in health-related quality of life score, adjusted for several covariates, after 12 months (positive value=treatment is better; negative value=treatment is worse)	e. patients in the digital system group had significantly greater increase in health-related quality of life score after 12 months compared to the usual care group (adjusted mean difference=0.04; 95% CI 0.01-0.06; p=0.008)
			f. stroke recurrence, adjusted for several covariates	f. compared to the usual care, the digital system is protective of stroke recurrence (adjusted RR=0.45; 95% CI 0.31-0.66; p<0.001)
			g. stroke hospitalization in the past year, adjusted for several covariates	g. compared to the usual care, the digital system is protective of stroke hospitalization (adjusted RR=0.44; 95% CI 0.31-0.64; p<0.001)
			h. moderate to severe disability, adjusted for several covariates	h. compared to the usual care, the digital system is protective of moderate to severe disability (adjusted RR=0.67; 95% CI 0.55-0.81; p<0.001)

Author/s (year, country)	Sample size and participants	Interventions groups	Outcomes	Key findings
Tabak, et al.[16] (2014, Netherlands)	29 patients with chronic obstructive pulmonary disease from a hospital and primary care physiotherapy practices	**Treatment:** technology-supported care program, which includes a web-based exercise program, an activity coach, a self-management module, and a teleconsultation module for 9 months (telehealth group) **Control:** usual care (as needed, in cases of impending exacerbation, and/or attendance to regular physiotherapy sessions, if prescribed) for 9 months (usual care group)	a. mean satisfaction with received care score (Client Satisfaction Questionnaire) at month 1 and month 3	a1. patients in the telehealth group had a lower mean satisfaction score at month 1 compared to those in the usual care group (26.4 [SE: 1.3] vs 30.4 [SE: 1.5])
				a2. patients in the telehealth group had a lower mean satisfaction score at month 3 compared to those in the usual care group (26.3 [SE: 1.3] vs 29.9 [SE: 1.4])
			b. number of hospitalizations	b. the numbers of hospitalizations in the telehealth group and in the usual care group were similar (5/12 vs 4/12, respectively)
			c. mean length of hospital stay	c. patients in the telehealth group had a shorter mean length of stay than those in the usual care group (22 days vs 36 days)
			d. number of emergency department visits	d. the numbers of emergency department visits in the telehealth group and in the usual care group were equal (5 vs 5)

Legend:

telemedicine group had better outcomes than control group

telemedicine group had worse outcomes than control

telemedicine group and control control group had similar outcomes

sample sizes of the studies included ranged from 29 to 10,815 participants. Follow-up periods ranged from 3 to 36 months. The telemedicine techniques that were used in the studies included mobile phone-based health interventions, telemedicine-based visits, and telephone-based health coaching. In general, most of the studies included in this review reported that telemedicine is as good as, if not better than, usual care approaches in achieving clinical and psychosocial outcomes.

In this review, a variety of telemedicine approaches have been utilized to provide care even in the comfort of the patients' homes, including mobile phone-based apps and health reminders, access to web-based health programs, remote patient monitoring, access to call center and health coaching services, and teleconsultations with clinicians.

Findings of the studies included in this review suggest that most of the telemedicine approaches used in NCD management improved or had positive effects on the patients' clinical and psychosocial outcomes—weight loss, blood pressure, pain, complications, laboratory parameters, lifestyle changes, self-management, risk reduction behaviors, physical function, disease knowledge, quality of life, and health care utilization. Only one outcome parameter—satisfaction with received care—was worse in the telemedicine group than in the non-telemedicine group.

As an approach, and especially when combined with other approaches, telemedicine makes health care safer, more accessible, and more convenient. Overall, telemedicine, when used correctly, can potentially produce an important positive impact on NCD care in general, and on patients with NCD in particular.

Contributors

MAA, PRC and DW contributed to the conceptualization of this article. All authors wrote the original draft, performed the subsequent revisions, approved the final version, and agreed to be accountable for all aspects of this report.

Article source

Submitted

Peer review

External

Competing interests

None declared

REFERENCES

1. World Health Organization. Noncommunicable diseases. 2022 Sep 16 [cited 2022 Nov 24]. In: World Health Organization [Internet]. Geneva: World Health Organization. c2022. Available from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases#:~:text=Key%20facts,%2D%20and%20middle%2Dincome%20countries.

2. World Health Organization Regional Office for Europe. Noncommunicable diseases. [cited 2022 Nov 24]. In: World Health Organization [Internet]. Copenhagen: World Health Organization Regional Office for Europe. c2022. Available from: https://www.euro.who.int/__data/assets/pdf_file/0020/140672/CorpBrochure_noncommunicable_diseases.pdf?fbclid=IwAR1lG6t3TxdpicXdIzoyXh6rwk1eaQqWM1dm2XafdRapjCmfBVGiDOc1FM0.

3. Mothiba TM. Self-Management Strategies to Curb the Development of NCDs in Rural Communities. In: Monyeki KD, Kemper HC, editors. Lifestyle and Epidemiology - The Double Burden of Poverty and Cardiovascular Diseases in African Populations [Internet]. London: IntechOpen; 2021 [cited 2022 Nov 24]. Available from: https://www.intechopen.com/chapters/75541 doi: 10.5772/intechopen.96222.

4. Tattersall RL. The expert patient: a new approach to chronic disease management for the twenty-first century. Clin Med (Lond). 2002 May-Jun;2(3):227-9.

5. Hearn J, Ssinabulya I, Schwartz JI, Akiteng AR, Ross HJ, Cafazzo JA. Self-management of non-communicable diseases in low- and middle-income countries: A scoping review. PLoS One. 2019 Jul 3;14(7):e0219141.

6. National Centre for Disease Information and Research. Application of Telemedicine in the Management of Noncommunicable Diseases. Bengaluru: Indian Council of Medical Research. Available from: https://ncdirindia.org/All_Reports/Telemedicine/resources/Tele_chapter2.pdf.

7. Rural Health Information Hub. Telehealth use in rural healthcare. [cited 2022 Nov 24]. In: Rural Health Information Hub [Internet]. North Dakota: Rural Health Information Hub. c2002-2022. Available from: https://www.ruralhealthinfo.org/topics/telehealth.

8. Yasmin F, Nahar N, Banu B, Ali L, Sauerborn R, Souares A. The influence of mobile phone-based health reminders on patient adherence to medications and healthy lifestyle recommendations for effective management of diabetes type 2: a randomized control trial in Dhaka, Bangladesh. BMC Health Serv Res. 2020 Jun 8;20(1):520.

9. Muralidharan S, Ranjani H, Mohan Anjana R, Jena S, Tandon N, Gupta Y, et al. Engagement and Weight Loss: Results from the Mobile Health and Diabetes Trial. Diabetes Technol Ther. 2019 Sep;21(9):507-513.

10. Ding H, Jayasena R, Chen SH, Maiorana A, Dowling A, Layland J, et al. The Effects of Telemonitoring on Patient Compliance With Self-Management Recommendations and Outcomes of the Innovative Telemonitoring Enhanced Care Program for Chronic Heart Failure: Randomized Controlled Trial. J Med Internet Res. 2020 Jul 8;22(7):e17559.

11. Bertuzzi F, Stefani I, Rivolta B, Pintaudi B, Meneghini E, Luzi L, et al. Teleconsultation in type 1 diabetes mellitus (TELEDIABE). Acta Diabetol. 2018 Feb;55(2):185-192.

12. Hinman RS, Campbell PK, Lawford BJ, Briggs AM, Gale J, Bills C, et al. Does telephone-delivered exercise advice and support by physiotherapists improve pain and/or function in people with knee osteoarthritis? Telecare randomised controlled trial. Br J Sports Med. 2020 Jul;54(13):790-797.

13. Greenwood DA, Blozis SA, Young HM, Nesbitt TS, Quinn CC. Overcoming Clinical Inertia: A Randomized Clinical Trial of a Telehealth Remote Monitoring Intervention Using Paired Glucose Testing in Adults With Type 2 Diabetes. J Med Internet Res. 2015 Jul 21;17(7):e178.

14. Dwinger S, Rezvani F, Kriston L, Herbarth L, Härter M, Dirmaier J. Effects of telephone-based health coaching on patient-reported outcomes and health behavior change: A randomized controlled trial. PLoS One. 2020 Sep 22;15(9):e0236861.

15. Yan LL, Gong E, Gu W, Turner EL, Gallis JA, Zhou Y, et al. Effectiveness of a primary care-based integrated mobile health intervention for stroke management in rural China (SINEMA): A cluster-randomized controlled trial. PLoS Med. 2021 Apr 28;18(4):e1003582.

16. Tabak M, Brusse-Keizer M, van der Valk P, Hermens H, Vollenbroek-Hutten M. A telehealth program for self-management of COPD exacerbations and promotion of an active lifestyle: a pilot randomized controlled trial. Int J Chron Obstruct Pulmon Dis. 2014 Sep 9;9:935-44.