Effects of Type 2 Diabetes Behavioural Telehealth Interventions on Glycaemic Control & Adherence: A Systematic Review

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Type 2 Diabetes

- Diabetes – 273 Australians/ day
  - 85 – 90% = Type 2 diabetes
  - 8th highest disease burden
  - $848 million/ annum[1]

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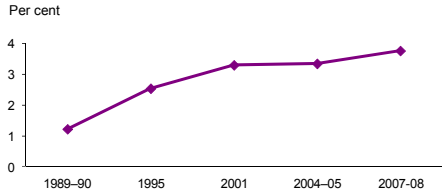
1. Australia's Health (2012)

Type 2 Diabetes

Rates in Australia



Source: *AIHW analysis of ABS National Health Surveys*

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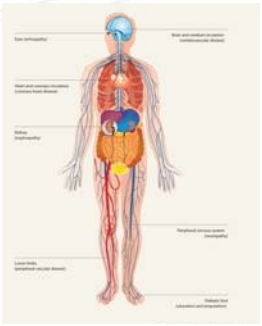
Diabetes Complications



Blindness

Cardiovascular disease

Stroke

End-stage renal disease

Amputation

Source: International Diabetes Federation Atlas, 2009

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Diabetes Complications Risk

Glycosylated haemoglobin (HbA1c) level

- Indicator of glucose control over past 3 months
- Related to diabetes self-management[1,2]

• Ultimate goal = HbA1c ≤ 7.0%[3]

• > 50% of diabetics - sub-optimum HbA1c (>7.0%)

1. DCCT (1993)
2. UKPDS (1995)
3. Diabetes Australia 2010

Self-management Support

• Regular, ongoing self-management support essential[1].

Barriers to effective self-care:

- *Personal* – motivation, cost, non-acceptance
- *Systemic* – Health system services/ professionals

• *Rural/ regional* – 26% Australian diabetics – inner regional; 12% -- outer regional/ remote areas[2]

• Poor health service access/ availability

• 20% Primary Healthcare providers serve c. 1/3 population

1. *Fisher et al. 2007*
2. *Australia's Health (2012)*

...Telehealth!

What we know about telehealth interventions for type 2 diabetes:

• Good acceptability & uptake by type 2 diabetes patients.[1]

• Efficacy in improving psychosocial, psychological, & clinical outcomes.[2]

• Numerous interventions incorporate behavioural techniques.

1. Verhoeven et al. (2007)
2. Wu et al. (2010)

Research Question

What are the effects of behavioural telehealth interventions aimed to improve glycaemic control and type 2 diabetes self-care?

Aims: To conduct a systematic literature review of the effects of behavioural type 2 diabetes telehealth interventions.

Methods

The Search:

- Databases: Ebscohost -
  - •CINAHL (Cumulative Index to Nursing & Allied Health Literature), Medline, & PsychInfo
- Terms:(diabet* AND random*) AND (tele* OR mobile OR SMS or smartphone OR video* OR ehealth)
- Publication date: no limit

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Methods

Study eligibility criteria:

- Peer-reviewed journal articles
- Published in English
- *Design*: Randomised controlled trials
  - Included usual care, or active control condition
- *Sample*: adults (age ≥ 18); majority T2D
- *Outcomes*: glycaemic control + ≥ 1 diabetes self-care outcome out of: physical activity, diet, BG self-monitoring, & medication adherence

Excluded: Primarily telemonitoring/ medication titration interventions; poor internal validity

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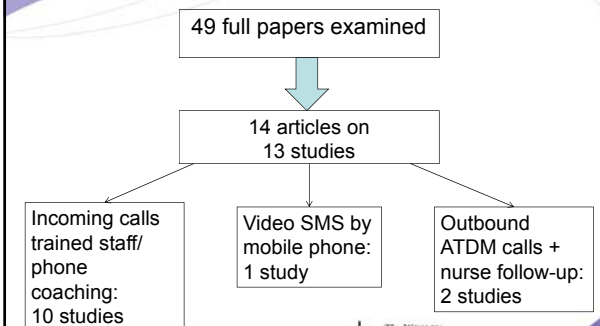
Results



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Results

Active intervention periods

•Range = 5 weeks[1,2] to 12 months[3,4,5,6]

Final outcome follow-up periods

•Range = 3 months[7,8,9] to 12 months[3,7,4,5,10,6] post-baseline

•69% of studies – endpoint measures post-intervention

•5 studies tested short-term maintenance effects[1,7,2,10,11]

•Longest post-intervention & final assessment interval = 6 months[10]

1. Frosch et al. (2011)
2. Sigurdardottir et al. (2009)
3. Anderson et al. (2010)
4. Piette et al. (2001)
5. Piette et al. (2000)
6. Walker et al. (2011)
7. Maljanian et al. (2005)
8. Kim & Oh (2003)
9. Nesari et al. (2010)
10. Bell et al. (2012)
11. Trief et al. (2011)

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Results

Glycaemic Control

- 4/ 13 studies –significant improvements[1,2,3,4]
  - 3 studies – improved diabetes self-care[1,2,4]
  - 2 studies – all 4 self-care areas improved[1,2]
- Dosage of intervention – 2 studies reported significant intervention dosage effects on glycaemia.[3,4]
- Exposure to intervention – duration of engagement significantly affects glycaemia outcomes.[3]
- Maintenance effects? 3/ 4 studies with significant outcomes tested directly post-intervention only.[1,2,4]

1. Kim & Oh (2003)
2. Nesari et al. (2010)
3. Bell et al. (2012)
4. Walker et al. (2011)

Results

Dietary Adherence

- 5/ 8 studies–significant improvements[1,2,3,4,5]
- Studies with significant improvements VS no improvements – No notable distinction between diet/ lifestyle interventions.
- Study sample heterogeneity – a contributing factor?
  E.g. Trief et al. (2011) – phone sessions on dietary goal setting & emotions - most participants obese.

1. Anderson et al. (2010)
2. Kim & Oh (2003)
3. Nesari et al. (2010)
4. Walker et al. (2011)
5. Sacco et al. (2009)

Results

Physical activity

- 5/8 studies – significant improvements[1,2,3,4,5]
  - 3 – no significant effects on glycaemia.[1,2,5]
- Most studies – only tested effects directly post active intervention period.

→Delayed effects of physical activity on glycaemia?

- Differential impacts of resistance VS aerobic training?

1. Frosch et al. (2011)
2. Wolever et al. (2010)
3. Nesari et al. (2010)
4. Walker et al. (2011)
5. Sacco et al. (2009)

Results

Blood Glucose Self-monitoring

- 4/ 9 studies – significant improvements[1,2,3,4]
- Common aspect: Participants regularly reported blood glucose levels to Researcher/ Nurse
  -- Accountability effects?
- Self-report surveys used for regular BGSM reports during study & study outcome measures.
- Cost of increasing BGSM accounted for by 1 study.[5]

1. Piette et al. (2001)
2. Piette et al. (2000)
3. Kim & Oh (2003)
4. Nesari et al. (2010)
5. Bell et al. (2012)

Results

Medication Adherence

- 3/ 8 studies–significant improvements[1,2,3]
  - 1 study – reported improved glycaemia + improved self-care in 3 other areas[3]
  - 1 study – ASK-20 but not Morisky[4]
- Medications not differentiated in general.
  - Walker et al. (2011) - insulin-dependent VS non insulin-dependent type 2 diabetics.
    - →No significant difference was found
- Future studies – analyse medication adherence within sub-groups.

1. Piette et al. (2009)
2. Wolever et al. (2010)
3. Nesari et al. (2010)
4. Walker et al. (2011)

Study Quality & Validity

- Internal validity moderate at best amongst studies.
- Allocation concealment – use unclear in 5 studies.[1,2,3,4,5]
  - →Risk of exaggerated treatment effects.
- Small sample sizes – most studies.
  - →Difficulties detecting significant treatment effects.
- Limited diversity in sample ethnicity
  - →External validity issues
- Study condition heterogeneity – Trief et al. (2011)
  - →Potential bias

1. Maljanian et al. (2005)
2. Wolever et al. (2010)
3. Kim & Oh (2005)
4. Nesari et al. (2010)
5. Trief et al. (2011)

Conclusions

- Study heterogeneity – outcomes & processes
  - →Difficult to draw firm conclusions.
- Overall review – behavioural telehealth interventions ***can*** significantly improve both glycaemic & diabetes self-care in type 2 diabetics.
- Physical activity & dietary adherence – most improvements in response to telehealth.

Conclusions

Suggested study improvements:

- Longer post-intervention follow-up measures – detect maintenance & "sleeper" effects.
- Effects of treatment dosage & duration need testing.
- Analyses of effects on different participant sub-groups are needed.
  - e.g. Insulin VS non-insulin dependent; HbA1c sub-groups)
- Effects of exposure – stronger treatment effects for more intensive exposure?
- Community sampling

Conclusions

•Study methodology & reporting needs improvement e.g. blind outcome assessment & allocation concealment.

→More confident conclusions drawn from reviews.

•Overall – behavioural type 2 diabetes telehealth interventions show promise of effectiveness.

...But... Significant developments & information about what factors are integral to effective interventions, are needed.

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Thanks for your attention

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Questions?

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