Scottish Government Health Directorates Chief Scientist Office

CHIEF SCIENTIST OFFICE

FOCUS ON RESEARCH

Telemetric supported self-monitoring of long-term conditions

Researchers
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Aim
Telemonitoring is a system where people with different conditions take measurements at home. The measurements are automatically shared with their doctor or nurse who can give advice or change treatment. This Programme looked at whether telemonitoring systems improve the control of a number of long-term conditions, prevent hospital admissions, and save patients' and clinicians' time, and to explore patients' and clinicians' perceptions and experiences of this model of care.

Project Outline/Methodology
We ran three randomised controlled trials (RCTs), and one feasibility RCT, with over 1000 patient participants. In each of the RCTS, patients were randomly split into groups. One group were given the telemonitoring system and the other group were looked after in the usual way. We ran these RCTs in each of the following conditions: Uncontrolled high blood pressure (BP), stroke or a transient ischaemic attack (TIA) with uncontrolled BP (the feasibility trial), Chronic obstructive pulmonary disease (COPD) and diabetes. For each of these conditions, we also carried out qualitative studies to see what patients and staff thought of the telemonitoring, and health economic analyses which looks at the costs and cost effectiveness of the different systems.

Key Results
We found that telemonitoring is effective in lowering blood pressure in people with hypertension, and is effective in lowering both glycated haemoglobin (HbA1c: a measure of blood sugar control) and BP in people with diabetes. However, no evidence was found that telemonitoring postponed admissions to hospital in participants with COPD. A feasibility trial of people with stroke/TIA showed that it is feasible to run a trial of telemonitoring in this group of patients and initial results suggest that telemonitoring had a positive effect on BP control. In most cases, telemonitoring systems were positively viewed by participants, whether they had an impact on the primary outcome (e.g. blood pressure, HbA1c, hospital admissions) or not. Views of telemonitoring from staff groups were more mixed: while the potential benefits were acknowledged, the impact on workload and staff roles, and the lack of integration with current electronic health records were raised as barriers.

Conclusions
This is the most comprehensive programme of telemonitoring RCTs ever undertaken. While telemonitoring systems are popular amongst patients with long-term conditions and can improve the control of some conditions, it does not reduce clinician workload or save resources. In COPD, we found no evidence that telemonitoring improved outcomes.

What does this study add to the field?
Telemonitotoring works in some conditions and in some service contexts but not in others. Further work is needed to see how it works at scale and how it can be improved.

Implications for Practice or Policy
The results from the COPD RCT have been influential in the UK and internationally and have in many areas stopped the use of intensive telemonitoring for COPD. For example, in NHS Lothian, intensive telemonitoring has been stopped in favour of a 'light touch' approach where patients are not routinely monitored. The potential impact of the results which demonstrated an effect on BP control and HbA1c is wide-ranging, but depends on further work to see how long these effects last. A trial of a large-scale roll-out of BP management by supported self-monitoring is also planned by NHS Lothian in association with NHS 24.

Where to next?
The success of the Programme has led to a number of funded follow-on studies related to the key areas of COPD, diabetes and stroke, as well as telehealth in general, particularly mental health, telepharmacy and the prevention and management of obesity.

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Feasibility study for a trial of blood pressure telemonitoring for people who have had stroke/ transient ischaemic attack (TIA).

Researchers
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Aim

Telemonitoring is a system where people with different conditions measure their symptoms at home. The measurements are automatically transmitted to their healthcare professional who can advise the patient or change treatment. The aim of this study was to find out if it is feasible to carry out a randomised controlled trial of blood pressure (BP) telemonitoring in patients who had a stroke or a TIA (also known as a "mini stroke"). We also aimed to find out what people with stroke/ TIA and staff looking after them thought of the system.

Project Outline/Methodology

We recruited 55 people with stroke/ TIA from general practices in Lothian, Scotland to take part in the study. We carried out a "pilot trial" where patients were split randomly into groups with a 3:1 chance of being in the group which received blood pressure monitoring for six months, with the other group receiving care as usual. People in the telemonitoring group received a blood pressure monitor to use at home as well as continuing with their usual care. This blood pressure monitor transmitted their blood pressure measurements via a mobile phone to a secure website which could be seen by the person at home as well as their own practice nurse or doctor. We looked at the feasibility of recruiting people into and retaining people in this study. At the beginning and at the end of the study, we also measured blood pressure, anxiety, depression, quality of life and how much the person's stroke impacted on them. We also interviewed 16 trial participants and four staff members, and we carried out three focus groups with 23 members of stroke support groups and seven carers.

Key Results

We found that it was relatively easy to recruit people into this study, and for them to use the tele-monitoring system during the study. After six months, we found that BP was much lower in the telemonitoring group than the group who had treatment as usual. However, we cannot say whether this is statistically significant as the study was not set up to test that. There were minimal changes to anxiety and depression scores in the intervention group, but there was an increase in healthcare usage, especially 'phone calls, and medication changes in both groups. The interviews showed that many participants had been worried about high BP and recurrent stroke, but professionals rarely shared the actual readings with them. The increased communication with staff as a result of telemonitoring was welcomed by patients. Generally, patients participating in the pilot trial found that taking their BP readings and transmitting them was easy and non-intrusive, although some needed reassurance that they were doing it correctly. However, when members of the stroke support groups (who were more disabled than people in the trial) were given the opportunity to try the system, some could not fit the cuff and said they would not have access to help.

Conclusions

A trial of telemetry supported home BP monitoring for patients who have had stroke/ TIA is both feasible and would be welcomed by this patient group and it should be possible to improve BP control in this group. There may be some people who would be unable to use the equipment due to their stroke.

What does this study add to the field?

The findings from this study suggest that a full scale trial of telemonitoring with people who have had stroke/ TIA is feasible, likely to recruit well and have good rates of compliance and follow up.

Implications for Practice or Policy

A full scale trial is needed before a definitive statement on the effectiveness of telemonitoring for this group can be made.

Where to next?

We are applying for funding to carry out a substantive multicentre trial in this area, and for funding to see if it possible to telemetrically assess activity levels (low activity is another major risk factor) in stroke survivors.

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FOCUS ON RESEARCH

The impact of a telemetric chronic obstructive pulmonary disease (COPD) monitoring service.

Researchers
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Aim
Telemonitoring in COPD allows people to record their symptoms and physiological levels (pulse and oxygen saturation) at home and automatically transmit them to their healthcare professional who can give advice or change treatment as necessary. The aim of this study was to find out whether telemonitoring helps people with (COPD) stay out of hospital.

Project Outline/Methodology
We recruited 256 people who had had an admission with COPD from Lothian, Scotland into a "randomised controlled trial" where patients were split into two equal groups with a 50/50 chance of being in either group. We gave one group the telemonitoring system and the other group were looked after in the usual way for 12 months. People in the tele-monitoring group received a tablet computer and used it to record symptoms and medication use by a touch screen questionnaire and the oxygen in their blood using a pulse oximeter every day. This information was sent by internet to a secure NHS website. Specialist respiratory clinicians or specially trained telehealth staff monitored the information and contacted patients if questionnaire or symptom responses looked unusual. To find out if the telemonitoring system had any impact, we checked hospital data about COPD admissions. We were particularly interested in whether it delayed admissions with an exacerbation ("flare up") of COPD. At the beginning and end of the study, we also measured quality of life, breathlessness, medication taken, anxiety and depression, knowledge about COPD. We asked about use of healthcare resources at 3, 6 and 9 months following start of the trial so that we could calculate the cost of the service. We also interviewed 38 patients and 32 staff members to see what they thought of the telemonitoring system.

Key Results
We found no evidence that the telemonitoring system had an effect on the time to the first hospital admission with an exacerbation of COPD, the number of admissions with an exacerbation of COPD, the number of days spent in hospital, or in the number of deaths. No evidence was found for any effect on quality of life, breathlessness, anxiety or depression, self-efficacy, knowledge, use of treatment. Alerts triggered an average of 25 clinical contacts with each telemonitoring patient during the year, and cost the NHS £2,066 more for each patient in the trial than the usual care. However, patients liked the telemonitoring service and reported that they found it helped their understanding of COPD and helped them decide when to adjust treatment or seek professional advice. Professionals thought that telemonitoring encouraged patients to follow medical advice and to take responsibility for their condition but they were concerned about creating dependence on clinicians.

Conclusions
The integration of telemonitoring into existing clinical services had no effect on delaying time to a hospital admission and did not improve quality of life. It had a substantial impact on workload and was not cost-effective. In its current form, telemonitoring is not likely to be a useful model for providing COPD care.

What does this study add to the field?
The study casts doubt on the efficacy of telemonitoring for COPD, suggesting that the positive effects seen in previous trials could be due to an enhancement of the underpinning clinical service rather than the telemonitoring communication itself.

Implications for Practice or Policy
These findings have halted the expensive implementation of intensive telemonitoring for COPD in many areas. In NHS Lothian, it has been replaced by a light touch approach where patients decide when they would like professionals to review their recorded readings.

Where to next?
We have received funding to look at whether exacerbations can be predicted by better algorithms using data gathered from this study, as well as a new study to see if respiratory rate can predict exacerbations. We have evaluated the new NHS Lothian COPD Light Touch Service.

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FOCUS ON RESEARCH

The impact of a telemetric monitoring service in type 2 Diabetes.

Researchers

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Aim

Telemonitoring is a system where people with different conditions take measurements at home. The measurements are automatically shared with their doctor or nurse who can give advice or change treatment. We carried out a study to find out if using this type of telemonitoring system with people with Type 2 Diabetes helped them control their diabetes, and also to find out what they and NHS staff thought of the system.

Project Outline/Methodology

321 people with type 2 diabetes were recruited from general practices across the UK to take part in this study. We carried out a "randomised controlled trial" where patients were split into two equal groups with a 50/50 chance of being in either group. One group was given the telemonitoring system and the other group were looked after in the usual way. People in the telemonitoring group received three devices: a blood glucose monitor, a blood pressure (BP) monitor and some weighing scales. These devices linked via "Bluetooth" to a modem which then transmitted the measurements by SMS to a remote website. This website could be seen by the patient's doctor or nurse and by the patient. We asked patients to measure their blood glucose 4 times a week, and their blood pressure and weight once a week. We asked practice nurses to check the results on the website at least once a week and to contact the patients by telephone or email to adjust therapy or reinforce lifestyle advice if necessary. All patients were in the study for nine months. At the beginning and end of the study, we measured: glycated haemoglobin (an indication of blood sugar levels over the previous two to three months also known as HbA1c), blood pressure, weight, cholesterol levels and sodium/creatinine fratio (which estimates salt intake). We also measured anxiety, depression, adherence to treatment, quality of life, exercise levels, knowledge of diabetes, NHS service use and prescriptions. We interviewed 25 patients and ten staff members to see what they thought of the telemonitoring system.

Key Results

We found that the people in the telemonitoring group had significantly lower HbA1c and blood pressure after nine months than the people who had treatment as usual. Telemonitoring made no significant difference to weight, cholesterol levels, urinary salt levels, health related quality of life, self-efficacy, anxiety, depression, adherence to treatment, self-reported activity or number of alcohol units taken per week. Despite some initial technical problems, the intervention was popular with patients, the equipment was easy to use, most people did not find testing a burden and patients appreciated the convenience of remote monitoring. Some patients found that seeing their results, and knowing that healthcare professionals could also see them, motivated them to manage their diabetes better. Staff participants felt better informed about patients, but they had some concerns about the workload involved in telemetric monitoring.

Conclusions

Our study has demonstrated that telemonitoring can be effectively applied in people with type 2 diabetes in a trial setting.

What does this study add to the field?

This study has shown telemetric monitoring of blood glucose can help improve HbA1c, and is the first to show that concurrent BP monitoring improves BP management, the two biggest risk factors for people with Type 2 diabetes.

Implications for Practice or Policy

When we started this study, home blood glucose monitoring (without telemetry) for people with Type 2 diabetes was being discontinued because research showed it was not effective. The results of this study therefore have wide ranging implications for the treatment of people with Type 2 diabetes. However, further studies are needed to see if the results we found at nine months are longer lasting.

Where to next?

We are exploring whether it is feasible to carry out a similar study in pregnant women with diabetes.

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