Developing a Tailored and Scalable Intervention to Improve Statin Adherence

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Background: Statins effectively prevent cardiovascular disease (CVD), yet adherence remains low (~25%), leading to avoidable events, hospitalisations, and increased healthcare costs. Modifiable influences (e.g. side effect concerns, forgetfulness) explain poor adherence but are underexplored across diverse populations, particularly underserved groups at highest CVD risk. While tailored interventions (e.g. counselling) have shown effectiveness, they are neither scalable nor cost-effective.

Objectives: To develop a scalable, tailored intervention to improve statin adherence by:
1. Identifying modifiable influences of adherence from literature
2. Exploring how influences vary across groups and individuals
3. Co-designing a tailored intervention to support adherence

Methods: We used behavioural science frameworks to guide a multi-phase study. Phase 1 included a systematic review of 70 studies and qualitative interviews with 17 patients from diverse backgrounds. Data were analysed using the Theoretical Domains Framework (TDF)[8] and triangulated to identify modifiable influences. Phase 2 involved selecting Behaviour Change Techniques (BCTs)[9] developed into draft SMS messages. A screening tool was created to tailor the intervention by identifying barriers. Eight co-design workshops were conducted with 7–12 participants each: six with patients, two with healthcare professionals (HCPs), and two with both groups. Workshops involved discussions, prioritisation, iterative refinement of SMS content, and assessment of feasibility and delivery. A Patient Advisory Group shaped recruitment, interview analysis, workshop planning and delivery, and intervention design.

Results: Fifty-eight modifiable influences were identified across 14 TDF domains. Common influences included knowledge about treatment, trust in HCPs, perceived statins' benefits, routine disruptions, uncertainty, and threat of disease. Influences varied across subgroups: family and peer influence and research scepticism were more common among ethnic minority participants, particularly South Asian and Black communities; primary prevention patients associated statins with ageing or lifestyle failure; and those with lower education presented misconceptions and inconvenience. Fifty-one patients and 21 HCPs participated in the co-design phase, resulting in 40 SMS messages incorporating 24 BCTs (e.g. action planning). A decision tree was created to personalise message delivery based on patient characteristics (e.g. CVD history, ethnicity) and barriers.

Conclusion: This collaborative, theory-driven approach produced a scalable, tailored SMS intervention to address diverse needs, including those at highest risk. It has potential to improve adherence and reduce preventable harm. User testing will assess usability and acceptability.

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Background

Statins effectively prevent cardiovascular disease (CVD), yet adherence remains low (~25%) (1), leading to avoidable events, hospitalisations, and increased healthcare costs (2). Modifiable influences (e.g. side effect concerns, forgetfulness) explain poor adherence but are underexplored across diverse populations, particularly underserved groups at highest CVD risk (3). **While tailored interventions (e.g. counselling) have shown effectiveness, they are neither scalable nor cost-effective** (4). This study aims to develop a scalable, tailored intervention to improve statin adherence using behavioural science frameworks.

Methods

Phase 1: Diagnosis → Phase 2: Intervention Design

Evidence Generation

Systematic review
70 studies using the **Theoretical Domains Framework** (TDF) (5) to identify modifiable adherence influences.

Interviews
17 diverse participants, coded into TDF domains to capture shared and subgroup-specific influences.

Survey
Secondary analysis of a primary care survey (n=233) on adherence determinants.

Triangulation of Influences

Combined findings from evidence generation to prioritise key influences.

Considered quantitative strength, expressed importance, and consistency across methods.

Classified influences as

Core: common across participants.

Tailored: varying by **group** or by **individual**.

BCTs Selection

Identified influences associated were mapped to **Behaviour Change Techniques** (BCTs) (6).

The **Theory and Techniques Tool** (TaTT) (7) and **APEASE** criteria (6) (Acceptability, Practicability, Effectiveness, Affordability, Side Effects, Equity) were applied to guide selection.

Selected BCTs were translated into draft SMS messages.
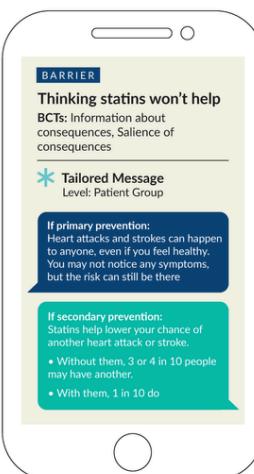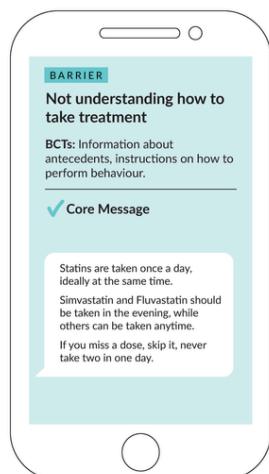
Co-design Workshops

A **screening tool** was developed for participants to complete in order to identify the specific barriers they experience, allowing the intervention to be individually tailored.

Six workshops and 2 stakeholder meetings were conducted with **21 healthcare workers** (HCWs) and **51 patients** from different backgrounds.

PATIENT ADVISORY GROUP

Example SMS Messages:
Core and Tailored Content Mapped to Patient Barriers and BCTs

BARRIER
Not understanding how to take treatment
BCTs: Information about antecedents, instructions on how to perform behaviour.

✓ **Core Message**

Statins are taken once a day, ideally at the same time.

Simvastatin and Fluvastatin should be taken in the evening, while others can be taken anytime.

If you miss a dose, skip it, never take two in one day.

BARRIER
Thinking statins won't help
BCTs: Information about consequences, Salience of consequences

✳ **Tailored Message**
Level: Patient Group

If primary prevention:
Heart attacks and strokes can happen to anyone, even if you feel healthy. You may not notice any symptoms, but the risk can still be there

If secondary prevention:
Statins help lower your chance of another heart attack or stroke.
• Without them, 3 or 4 in 10 people may have another.
• With them, 1 in 10 do

BARRIER
Problems with swallowing
BCTs: Social support (unspecified), Restructuring the physical environment

✳ **Tailored Message**
Level: Individual

Maria, you mentioned having trouble swallowing pills. Using a pill cutter or having water on hand can help.

If this is still a problem, contact your GP surgery to find better options.

It is okay to ask for a change

Results

Phase 1: Diagnosis

58 modifiable influences identified across 14 TDF domains

Core influences:
• Knowledge about treatment, support from HCWs, events disrupting routines, perceived statins' benefits, uncertainty, wanting to preserve wellbeing/lifespan

Tailored influences:

GROUP
• **Ethnic minorities:** social comparison, perpetual dependence, cultural/religious practices.
• **Primary Prevention:** illness acceptance, symptomless cholesterol, perceived capability to control cholesterol with lifestyle changes.
• **Secondary Prevention:** perceived CVD risk, perceived need for treatment, parental and professional role.
• **Lower education:** treatment misconceptions, social support, major life events.
• **Polypharmacy:** regimen complexity, emotional distress, loss of valued role, lower priority for statins.

INDIVIDUAL
• Swallowing problems, experienced side effects, scepticism towards pharmaceuticals, issues with renewing prescriptions.

Phase 2: Intervention Design

Co-Design Insights
• **Short, clear, respectful messages preferred.**
• Tone and timing preferences highly individual.
• Patients wanted concrete advice; HCWs preferred GP referral.
• HCWs requested minimal onboarding effort.
• Two-way messaging desirable, not essential.

Intervention Outputs
• Tailored SMS intervention with 40 messages using 24 BCTs, ready for user testing.
• Some of these will be sent to all **(core messages)**; others vary based on group or individual influences **(tailored messages)**.
• Screening tool & decision tree guide tailoring.
• Patients can choose reminders, set timings, update barriers.
• Two-way messaging designed but cannot be tested at present due to technical/resource constraints.

Conclusion

① This collaborative, theory-driven approach resulted in a scalable, adaptable SMS intervention to address diverse needs, including those at highest needs.
② The intervention is individually tailored to patients' reported barriers, patient groups and preferences, recognising that experiences and priorities vary widely, even within groups.
③ User testing will assess usability and acceptability. A future trial will evaluate its impact on adherence and patient outcomes.

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