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Early experience of the use of short message service (SMS) technology in routine clinical care

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ABSTRACT

Objective To conduct a technical appraisal and qualitative interviews with short message service (SMS – mobile phone text message) users in mainstream health care.
Design Observation of service usage followed by in-depth semi-structured interviews.
Setting A National Health Service (NHS) general practice in Scotland.
Participants One hundred and eighty patients registered.
Main outcome measures Service utilisation and patients' views.
Results It was technically feasible to open up access to mainstream NHS general practice services using SMS for appointment booking, repeat prescription ordering, clinical enquiries and remote access to the core clinical summary.
Conclusion Patients were able to use SMS services responsibly and found automation of prescription ordering particularly useful. Service utilisation was modest and did not adversely impact on the workload of general practitioners (GPs) or their staff.

Keywords: general practice, mobile phone, short message service

Introduction

Health context

Access to GP services within the NHS is important to patients, clinicians and government.[1,2] In consumer surveys patients consistently cite difficulty in arranging appointments due to busy telephone lines. Telephones are also insecure methods of communication unless a password system has been implemented.[3] Attempts to streamline booking by providing more 'same day'

appointments has created excessive demands on general practice telephone lines between 8.00 am and 10.00 am. GPs under pressure retort that sometimes patients themselves are to blame for appointment difficulties through non-attendance.[4,5] Ensuring an appropriate relationship between clinicians and patients who seek their advice electronically remains a major problem as the recent case of the eMed site shows.[6]

Repeat prescription ordering has also become a source of frustration for some patients as different GP practices have differing policies on ordering – by post, telephone answering machines or telephone. Many practices have now introduced the option of email as a means of reordering. The greatest pressure on GP time has always been and is likely to remain the demand for face-to-face consultations. Many doctor–patient exchanges need not be face-to-face, or even synchronous, hence the rising popularity of email communication for some aspects of non-urgent communication.[7]

SMS in health care

SMS, or mobile phone text messaging, has been subject to an exponential increase in use and *is* now a fundamental part of modern communication, particularly among young people. Exploratory work in supporting young adults with asthma and diabetes via SMS has not yet entered the realms of mainstream care.[8,9] Medication reminder services and appointment reminder services based on SMS have been slow to catch on, possibly because one-off projects not integrated into routine clinical practice are difficult to sustain.[10] The Cochrane Collaboration lists several SMS/text messaging projects but shows a paucity of completed studies.[11]

Box 1 SMS

Short message service (SMS), better known as text messaging, originated as a way of allowing telecom engineers to communicate short pieces of jargon asynchronously. SMS rapidly evolved to become a dialect and subculture hugely popular among young adults enfranchised by the communication opportunities of the mobile phone. There is discordance between the formality of traditional health service interactions face-to-face or by telephone and the anarchic appeal and convenience of SMS unconstrained by spelling, grammar or formality. The casualness of SMS as a communication medium with inherent risks to security and confidentiality presents a challenge to patients and staff.

If general practice is serious about improving access to services then it is pertinent to review how modern communication can be harnessed to meet perceived patient demand.[12] SMS access to GP services offers the potential advantages of convenience and 24-hour availability. Unlike email, which requires access to a computer and a basic skill level in technology, mobile phone SMS use is almost universally accessible regardless of income, literacy level or technical skill. SMS access to healthcare services may be one way of reaching out to those sections of society with unmet medical need but who, for reasons of geography, poverty, low literacy or lack of technical proficiency, find it awkward to access medical care in an efficient and effective manner.

Experience with a project to give patients email access to appointment booking, repeat prescription ordering and clinical enquiries prompted us to extend the service to SMS users.[6] This paper reports on the technical feasibility and qualitative research findings of allowing patients access to care from mainstream NHS GP services via SMS, in line with national e-health strategies for greater patient engagement.

Method

Technology

We used a computer agent-based system to assign each component of the 'real world' a 'virtual world' equivalent.[13] Each patient, and the receptionist, prescription clerk and GP were assigned a software agent to allow automated communication using preset parameters.[14] The use of agent-based systems in health care represents a growing trend,[15] but this is the first time it has been used in a mainstream primary care environment. Incoming SMS messages were converted to email for ease of processing by the practice and outgoing messages automatically converted back to SMS for patients to receive on their mobile phones.

Recruitment of patients

We sought and obtained permission from our Local Research Ethics Committee (LREC) to run the SMS service as a research project. This allowed us to communicate with our patients using methods not normally part of routine NHS care, and afforded patients the protection of independent audit and scrutiny. The LREC consent form included a section authorising us to study and report on patients' use of the service.

Box 2 Agent-based systems

Multi-agent systems form a 'virtual software world' to model 'real world' interactions between individuals, groups and institutions. Each person or component within a system is represented by a piece of software which is autonomous, proactive, interactive, and communicates and conforms to a set of rules. A software agent in an online auction places bids up to a set value within a set time frame according to a set of rules. A healthcare agent acting on behalf of a patient can make appointments, reorder prescriptions and communicate with the real patient to confirm any completed or agreed transaction. The collective actions or 'behaviour' of agents' communication with each other and with other people defines the field within 'artificial intelligence'.

Throughout 2006 we placed notices and credit card sized fliers in the waiting room of an urban practice with 11 000 patients drawn from a complete section of society (see practice website www.westgatemedical practice.co.uk) and ran a feature on use of SMS in a quarterly practice newsletter. Patients who expressed an interest in using SMS to access services were invited to read an information sheet (Appendix 1) and then sign an LREC form if they agreed to take part. On receipt of signed consent we entered each participant's mobile phone number and Community Health Index (CHI) number onto the agent-based communication system via a secure web portal. We then sent each patient, by SMS, the dedicated practice SMS number.

Staff training

All staff involved in reception or repeat prescribing activity and the GPs were shown how to recognise an incoming email originating from an SMS, log on to a dedicated web portal via a desk top icon and confirm that the patient's mobile phone number and CHI number matched. Staff then replied to the patient directly using the appointment, repeat prescription or clinical sections of the service. Staff used their computer keyboards to reply to patients and at no time had to handle mobile phones or use 'text' language.

Services

Appointments

Incoming GP appointment requests, generated at any time of the day or night via SMS, were responded to each morning by the duty receptionist offering the patient the nearest or best-fit appointment to match their request. On receipt of an acceptance SMS from the patient an automatic reminder service was offered. This would send an appointment reminder 24 hours and again two hours before the agreed appointment time. Staff had the option of reallocating appointments if the patient had not confirmed their intention to attend on receipt of the two-hour reminder SMS. Once the project was established we wrote to 20 of our patients who had a history of not keeping appointments and invited them to register for the SMS service. The intention was to encourage use of the automatic reminder service and thus avoid DNAs wasting practice time.

Repeat prescription ordering

We invited all patients enrolled in the SMS service who were in receipt of regular repeat prescriptions to try an automated ordering system. We programmed each patient agent to generate a request for renewal of a repeat prescription one week before it was due. This prompted the receptionist agent and pharmacy agent to process the relevant prescriptions, print them for signing by the GP, and forward them to the patient's chosen pharmacy. An SMS was then sent to the patient inviting them to collect their prescription direct from their preferred pharmacy. As a safety measure, the next cycle of prescription ordering was not activated until an SMS was received from the patient confirming they had collected the prescription.

Clinical enquiries

Incoming clinical enquiries from patients using SMS were converted to email, directed to the patients' usual GP (or RN in the GP's absence) and replied to. Direct SMS correspondence with patients was copied into their electronic clinical notes using a simple 'cut and paste' method. A complete log of all agent-based communication was held.

Core clinical summaries

We offered registered patients by SMS the option of requesting a short SMS version of their core clinical summary, extracted from their general practice electronic case record. We broke the core clinical summary into short sections in case the patient should wish to store them on their mobile phone: basic health data including most recent blood pressure; height and weight; allergies; repeat prescriptions; major medical morbidity. Prior to inviting a patient to access or store their core clinical summary using SMS RN personally checked the clinical accuracy of the summary held on the patient's general practice records.

Patient feedback

We contacted ten patients who had registered for all the available SMS services, including core clinical summaries, and invited them to take part in feedback interviews at the practice with an external qualitative researcher.

Results

Technical and safety issues

In the early stages of the project we experienced interruption of service when the web service to which we had outsourced was upgraded or updated. Eventually we set up our own secure web server to eliminate this problem. In the first six months of service provision there have been no adverse patient safety events. During this time a total of 180 patients have registered for the service. Initial concerns that the project would be impaired by problems with mobile phone theft or abuse of the service by unscrupulous users were unfounded. We are aware of one non-urgent clinical SMS from a patient which was sent from abroad and not received by the practice for several days. We have had no other patient reports of messages not being replied to. One patient changed her mobile phone number in the course of the project. This was recognised as part of the security verification procedure.

Patient views and jargon

Three patients sent us 'thanks' or 'ta' messages. Anecdotally, many service users mentioned to reception or medical staff that they found the service useful. Most were pleasantly surprised that their practice had decided, on its own initiative, to try to make patient communication easier and more convenient. No patients raised the issue of the modest cost of sending or receiving SMS. In our registration and consent form we asked patients not to use excessive text message jargon in the interests of safety and clarity. This guideline was almost universally adhered too, with the only instances of text jargon being established idioms such as 'hi', 'pls' (for please) and l8r (later).

Staff feedback

Initial concerns from our more mature reception staff that they would have to operate mobile phones or learn text jargon were not borne out when they realised that all incoming messages would be converted into a familiar email format for processing. We made it clear at the outset that the practice was not responsible in any way for maintenance of patients' mobile phones. We had no requests from patients relating to technical matters. Staff expressed the view that any attempt we made to make communication with the practice easier for young adults or people with busy work schedules would be desirable.

Appointments

In the first six months of service operation only three registered patients opted to request an appointment via SMS. None of them used our automatic appointment reminder service. All these requests were initiated out of office hours. None of the 20 patients with a 'DNA' history who were invited to use the SMS appointment reminder service did so.

Prescriptions

Twenty patients registered for SMS services were in receipt of regular repeat prescriptions for one or more long-term health conditions, and 11 opted to use SMS to order one or all of their repeat prescriptions over the following six months. Three patients frequently used the SMS service to request items in between their usual reordering times or for requesting aids and appliances not readily integrated into medication reordering. One patient notified the practice direct to update her repeat prescription list following a visit to a hospital clinic. Requesting and processing repeat prescriptions dominated the SMS dialogue between patients and the practice.

Clinical enquiries

There were only two clinical enquiries using SMS. These were managed without recourse to face-to-face consultation. Both were simple requests for advice that the patient deemed did not warrant inconveniencing either themselves or their GP by booking a formal appointment.

Core clinical summary

Only ten registered patients requested and received an SMS version of their core clinical summary. On receipt of their summaries, none of the patients used SMS to comment on them and we are unaware of any patients subsequently consulting or telephoning the practice to report concern or comment on what they had received.

What our patients said

Six of the ten patients who had received their clinical summary by SMS agreed to be interviewed to provide in-depth feedback. They all found completion of the LREC registration form to be straightforward, and all were attracted to register for SMS services predominantly by the prospect of easier and more convenient access to services and communication with doctors. Patients' reasons for requesting their core clinical summary were either personal curiosity or to check specific information in their medical record (e.g. current medications). Views about the content of the core clinical summaries ranged from those patients who felt that the medical information was, perhaps, too general and rudimentary to those who felt it was sufficient and helpful.

> 'I don't keep very well. I can text in for my prescriptions. It saves having to come to the surgery.' (Female patient, aged 50)

Services accessed by those who had used the SMS service included appointment booking, prescription ordering and clinical enquiry. Informal feedback from these patients was favourable. As an improvement to the service, it was suggested that clearer guidance be given to patients about when they should expect a reply to their SMS from the practice.

Amongst those who had registered but not yet used SMS, individual circumstances had led to continued use of telephone and email for accessing services, although it was indicated that this might change in the future. There was recognition amongst patients that the system development was at an early stage.

> 'I'm appreciative of the fact that this is a developing system, so presumably as the years roll on this will become more sophisticated. I was quite impressed.' (Male patient, aged 58)

Suggestions for additional medical information that might be included within the core clinical summaries included blood type and clinical test results.

None of the patients had yet had occasion to access and use their core clinical summaries in relation to their immediate medical care. However, patients felt that it was valuable to have this information easily accessible if circumstances arose where they might need their medical information (e.g. emergency situations). Those patients who had shared their core clinical summaries had done so only with immediate family members. None of the patients had stored their health information on their mobile phone; however, in some cases patients had stored the relevant mobile telephone number so that they could access this as required. No concerns were expressed by patients about the security of the SMS services.

Discussion

SMS technology in routine health care

This is the first reported study into the use of SMS technology to access mainstream NHS care. Our early experiences in its use suggest a proportion of practice patients will use an SMS service responsibly to meet their need for more efficient and convenient access to GP services. Once we established a dedicated secure server we had no technical problems impacting on clinical care. Formal and informal patient feedback about the service was universally supportive. Patients did not view the registration process as a barrier to accessing SMS services and expressed no concerns about the storage and security of electronic information.

Anecdotally, several patients were favourably impressed that we were attempting to make our services more accessible to young adults and liked being able to use SMS services for their own convenience but also for the altruistic reason that by so doing they were freeing up use of the practice telephone system for other people less technically literate than themselves.

Clearly there are security concerns to staff and health service institutions unfamiliar with the concept that agent systems do not store and retain information such as patients' medical summaries. The decision to request, receive, display on a mobile phone and share thus rests with the patient. Agents access and forward discrete items of data from case records but do not serve as a repository of patient case files. In effect a patient 'opts in' to obtain information about themselves equivalent to the NHS clinical spine, without 'opting in' for this to be shared or distributed to anyone other than the people they choose to allow to see their mobile phone display.

Disappointing uptake figures?

The service uptake was slow. However, our intention throughout the project was to allow an SMS service to grow, develop and be refined rather than to push for mass recruitment. Interviews with patients also indicated that registration for SMS services does not necessarily mean that patients will use all the available services because there may still be a preference for telephone contact with the practice. As we gained experience of the technological and human aspects of offering access to clinical services in a novel way we proceeded through a gradual, incremental method. We were surprised at how few patients took up the option of appointment booking by SMS. We had hoped our young adult patients would respond to our efforts to embrace a technology favoured by them.

In reality few young adults are regular users of GP services, and only a modest proportion of our young adults are likely to have consulted the practice during the study period and seen notices about the project. Our service was designed for people with long-term health conditions planning their health needs in advance whereas use of NHS services by young adults is typically haphazard and reliant on requests for urgent or same day access.

Popularity of repeat prescription ordering

Use of SMS to order a repeat prescription was more popular, in keeping with experiences of email usage. The automatic ordering of repeat medication with an inbuilt safety check exemplifies the potential for agent systems to make life easier for patients and staff. It would be premature to claim such an innovation might improve compliance by helping patients to reorder before rather than after their supplies run out. There is also scope for elimination of waste of expensive medicines because unlike conventional reordering systems the agent-based system requires the patient or their representative to confirm safe receipt of each batch of new medication.

Concerns about trivia or abusive messages

Our concerns about being inundated with trivial clinical enquiries by SMS were unfounded. As with email communication, those patients who take the time and trouble to register for a service with their own practice are capable of behaving responsibly. We encountered no abusive or inappropriate messages. The low uptake suggests that those most likely to find the service useful are those least likely to know of its existence or be prepared to make the commitment of reading and signing an LREC enrolment form. We could have opted for an anonymous 'chat line' type of SMS service to encourage more young adults to participate but our intention was to build and integrate a communications system into mainstream NHS care. This by definition requires patient identification and the ability to record and store a full record of dialogue in the patient record.[15,16]

Mainstream GP services can be safely and responsibly accessed by patients using SMS

In conclusion, mainstream NHS GP services including appointment booking, repeat prescription ordering and clinical enquiries can be safely accessed using SMS and mobile phones. The majority of patients using the service did so to make their existing use of services, particularly ordering repeat prescriptions, more convenient. We still have some way to go in persuading young adults and those with social or economic exclusion issues to access GP services using a simple low-cost low-technology approach.

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CONFLICTS OF INTEREST

RN, CalicoJack.co.uk and the Chief Scientist Office hold joint Intellectual Property Rights on aspects of the use of agent software to support health care.

The authors are all free to express their own opinions.

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Appendix

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EMAIL, TEXT MESSAGE, AND RAPID ACCESS TO YOUR TEST RESULTS AND PERSONAL MEDICAL RECORDS SERVICES

Would you like to be able to use email or your mobile phone text message system to access some medical services? We have an established email service within the practice to allow you to request appointments, order repeat prescriptions and ask simple clinical enquires. We have extended this so that you can now use a mobile phone to access these services. We are also developing a system to give patients rapid access to the results of X-rays and blood tests. In time we also plan to give patients rapid access to a summary of their own medical records using email and advanced mobile phones.

It is important that we test and evaluate these new services. For this reason we invite people who wish to use these services to become part of a research project so that we can test the safety and acceptability of what we are doing. There are concerns about security, confidentiality, and fears that patients may not be seen or assessed properly if an email or text message were to take the place of a formal face to face consultation.

If you have access to email or a modern mobile phone you are welcome to participate in this study within the practice. If you agree to take part we shall give you an email address and text message number that can be used to request appointments, repeat prescriptions, ask your doctor or nurse questions, obtain results of tests, and view a summary of your clinical record. We shall then study how this service is used and see if we should develop it further.

The Chief Scientist Office of the Scottish Executive Health Department is supporting this study. We are keen to find out how patients using the NHS in Scotland might want to use modern communication methods.

How do I take part?
Complete a consent form available from main reception. You will need to give your name, date of birth, email address or mobile phone number. We need you to sign a consent form so that we know you understand this is a new project currently not part of routine NHS care. You can take as much time as you need to complete this form. You can ask reception or clinical staff questions if you wish. If you decide not to take part that is OK. If you decide to take part and then change your mind you can withdraw from the project at any time without giving a reason. Your medical care will not be affected in any way if you decide not to take part or withdraw from the study.

What next?
Once we receive a completed consent form we shall send you an email or text message. This will contain instructions on how to use the service and the email addresses and text phone line to use when requesting an appointment, repeat prescription, test result, clinical advice or access to a summary of your medical records.

Do I require my own email address to take part?
Yes for the email service. If you take part you can send and receive emails from home, work or an internet café, but it has to be your own email address that you use.

Do I require my own mobile phone to take part?
Yes for the text message service. Be very careful about letting other people access your phone. Contact your service provider immediately if it is lost or stolen.

Will it cost me money?
Probably not. Emails and text messages cost far less than ordinary phone calls. It will certainly save you time. You may chose to have us forward repeat prescriptions directly to a pharmacist of your choice to save you having to attend Westgate.

Will irresponsible people mess up the service?
We have found our patients to be very responsible about the use of the email service. We shall prevent people misusing our text booking appointment system by sending automatic appointment reminders to people who book an appointment using a text message. Failure to confirm attendance by a text will result in the appointment lapsing and being allocated to someone else. This will reduce the rate of 'Did Not Attend' appointments.

Can I use text jargon?
Y, if U R crtn we cn undrsnd U OK.
Keep text messages less than 168 characters. Don't try to abbreviate medical terms or drug names.

If I do not have access to email or my own mobile phone can I still take part?
No, we are looking at communication between people with email, text messages and ourselves. If the project proves to be useful, it may encourage more people to obtain and use email or access the health service using text messages. If you do not have email or a mobile phone your medical care will not be adversely affected in any way. Many TV cable packages now offer email or text services.

Will I be disadvantaged by not using the service?
No. The more people who use email and text messages to access our services the less our phone line is likely to be engaged. The use of electronic communication media saves us time and allows us to spend more time in face to face consultations.

Will email or text messages replace traditional medical care?
No. We want to speed up and automate routine administrative tasks so that we can spend more time seeing patients.

Can the practice help with technical support for email, text or internet?
No. We cannot give any technical support or advice to you about computing or phone matters.

Can emails or text messages be used in an emergency?
No. Under no circumstances should patients contact us using email or text messages for urgent or emergency matters. The consent form allowing access to the project makes it clear you must understand this before taking part.

How will my emails or texts be responded to?
At least once in every 48 hours we shall look at the emails and text messages we have received from patients. We shall respond according to whether they concern repeat prescription requests, appointment requests, clinical enquiries, test result requests or records access.

Will I be able to send and receive emails or text messages with my own doctor?
Eventually you may be able to, but initially we shall respond to emails and texts on a practice basis.

Why might I want to see a summary of my medical records in an email or text message?
We would find it helpful if you check the details we hold about major medical illnesses, operations, prescribed medication and important allergies is accurate. You might want access to this information to show to your dentist, pharmacist, or hospital if you fall ill abroad.

What about a test result containing bad news?
We always have and always will only issue results of important X-rays or blood tests during face to face consultations. You might chose to receive results of routine monitoring of thyroid, chemotherapy or warfarin therapy automatically by email or text. You might like an immediate notification as soon as we know a routine test result is satisfactory.

Will other people be able to read my emails or texts?
Once an email or text from a patient arrives at the practice it will be confidential, just like all other paper or computer medical records. We shall not copy or share its content with anyone outside the practice. During the study period when we are looking to see if emails and text messages might be useful, we shall have a research assistant helping us. He or she will be able to read your emails and messages, but will be bound by the same rules of confidentiality that apply to all our other staff.

Emails and text messages can be seen and read by others as they move from your computer or phone to your internet or phone service provider and back. Be very careful not to send emails and texts to the wrong person. We advise you not to include any personal or private details about yourself which might cause you harm or embarrassment if sent to the wrong place or seen by the wrong person.

When we reply to you using email or text we shall take similar steps to ensure that if the message is seen or forwarded to another person it would not cause embarrassment, offence or harm.

How do I make sure my emails or texts always arrive at the practice and that replies always reach me?
Neither you nor we can guarantee safe sending and receiving of emails or texts. For this reason we ask you not to send anything that if seen by the wrong person would cause embarrassment, offence or harm. When writing a 'medical email or text' keep it simple, short, and of a general nature. Our replies back will be simple, short and general in nature.

Will I receive junk mail or texts?
No. If you take part we shall not pass on your email address or phone number to anyone else. We shall not use your email address or mobile phone to communicate with you for any non-medical matters. We shall keep your email address and mobile number in the same secure confidential way that we keep your address and telephone number. Please do not send us any junk, computer viruses, circular emails or texts. We shall remove you from the project if you do.

Will I have to answer any questions about the project?
If you decide to take part we should like to ask you about what you thought of the project. We should like to ask you views on what you see as the advantages and disadvantages of modern methods of communication with your practice. At the end of the project we may send you a questionnaire. Completion will of course be optional.

What is the technology behind all this?
Multi-agent Systems are a modern method of computing where different interests within a system are represented and communicate with each other using 'agents'. If you register for the service we shall create an 'agent' for you. This agent is a piece of secure software that allows you to communicate with us using e-mail or text messages, and allows your personal details to be securely stored and quickly accessed. The University of Dundee spin-off company CalicoJack (www.calicojack.co.uk) are our technical partners in this research.

Any questions?
If you are unsure about whether to take part you are welcome to speak to any of the doctors or nurses in the practice to ask questions. Dr Neville is leading the project and will be responsible for researching whether it is useful or not. He would be happy to speak to you about any aspect of the project.