A novel use of QR code stickers after orthopaedic cast application

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ABSTRACT

INTRODUCTION We present a novel solution to ensure that information and contact details are always available to patients while in cast. An information sticker containing both telephone numbers and a Quick Response (QR) code is applied to the cast. When scanned with a smartphone, the QR code loads the plaster team's webpage. This contains information and videos about cast care, complications and enhancing recovery.

METHODS A sticker was designed and applied to all synthetic casts fitted in our fracture clinic. On cast removal, patients completed a questionnaire about the sticker. A total of 101 patients were surveyed between November 2015 and February 2016. The questionnaire comprised ten binary choice questions.

RESULTS The vast majority (97%) of patients had the sticker still on their cast when they returned to clinic for cast removal. Eighty-four per cent of all patients felt reassured by the presence of the QR code sticker. Nine per cent used the contact details on the cast to seek advice. Over half (56%) had a smartphone and a third (33%) of these scanned the QR code. Of those who scanned the code, 95% found the information useful.

CONCLUSIONS This study indicates that use of a QR code reassures patients and is an effective tool in the proactive management of potential cast problems. The QR code sticker is now applied to all casts across our trust. In line with NHS England's *Five Year Forward View* calling for enhanced use of smartphone technology, our trust is continuing to expand its portfolio of patient information accessible via QR codes. Other branches of medicine may benefit from incorporating QR codes as portals to access such information.

KEYWORDS

QR code – Cast care – Healthcare reform – Patient education handout

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Dating from around 1600BC, the Edwin Smith papyrus is the earliest surviving surgical text.¹ It details the management of fractures in ancient Egypt where limbs were bound in cloth and bathed in alum to increase the rigidity of the material. Since then, fracture splinting techniques have continued to evolve with plaster of Paris being popularised during the Crimean war and more recently, the development of synthetic casts.² Despite these ongoing improvements, the problems associated with casting have remained.⁵ Ulcerations from pressure points, rashes, dermatitis, swelling, loss of fracture position and cast breakdown are well documented complications. Management of both these and patient concerns, especially if recognised early, is often simple with little impact on treatment outcome. However, delay in recognition has the potential for devastating and long lasting effects.⁴

Currently, the most routine form of passing information to patients who have had a cast applied is via an information leaflet. Although useful, misplacing the leaflet or not having it

to hand when needed is a common problem. Indeed, in a previous trust-wide audit, it was discovered that only 10% of patients were given an information leaflet in the first place.

This problem led directly to the development of a novel solution to ensure that contact details are always to hand for our patients while their cast is in situ. A sticker (or roll of tape on backslabs) containing both telephone numbers and a specific Quick Response (QR) code is applied over the outside of the cast (Fig 1). The phone numbers are direct numbers to the plaster team and the QR code takes the user directly to the plaster care webpage on the hospital website.

A QR code is a form of matrix or two-dimensional barcode. It consists of square black dots arranged in a square grid on a white background, which can be read by a suitable imaging device. QR scanner applications are readily available for smartphones and usually free to download. Once scanned, the code is converted to a uniform resource locator (URL), allowing quick access to a webpage for appropriate information, thereby bypassing the need for

typing the URL into a web browser. The aim of this study was to discover how many patients used the QR code and whether it was a useful tool for all casts applied in the trust.

Methods

A webpage was developed with the hospital IT team.⁵ The webpage has explanatory information about casts found on the paper handouts given out in the plaster room. There are also links to videos developed for the department. Video topics include 'How to prevent a pressure ulcer', 'Looking after your cast – a guide for patients', 'Accelerating your recovery after having an arm cast' and 'Accelerating your recovery after having a leg cast'. Each of these videos was three minutes in length. The quality of the information on the website was graded as 'high quality' with 'minimal shortcomings' using the DISCERN tool, a validated instrument for assessing the quality of healthcare information (<http://www.discern.org.uk/>). A QR code was then made that linked to the webpage.

A 40mm × 30mm extra permanent waterproof vinyl information sticker was designed for application to all synthetic casts fitted in the plaster room. On returning to the plaster room, patients were asked to fill in a questionnaire to ascertain information about the use of the sticker and whether any improvement could be suggested. Patients were surveyed between November 2015 and February 2016. The questionnaire contained binary (yes/no) questions with a text box for comments at the end. Simple demographic details were also collected, including the length of time the cast was in situ.

Results

A total of 101 patients filled in the questionnaire. The mean patient age was 50 years (range: 10–90 years) and 53% of the cohort was female. Over two-thirds (70%) of the patients had lower limb casts and the mean length of time these casts were in situ was 28 days (range: 3–84 days). The remaining patients in the study (30%) had an upper limb cast, with the mean length of time in cast being 26 days (range: 8–45 days).

The vast majority (97%) of patients still had the sticker on their cast when they returned to clinic to have their casts removed, and 84% felt reassured by the telephone numbers and QR code on their cast. Over half (56%) had a smartphone, which had the potential to be used as a QR code reader. A third (33%) of those who had a smartphone scanned the code. Of those who scanned the code 24% had a lower limb cast and only 7% had an upper limb cast. 95% found the information useful if they scanned the QR code. Nine per cent of the patients used the contact details on the cast to seek advice. Information leaflets were still handed out and 80% of the patients said they were given a leaflet. The majority (96%) read the leaflet but 20% of those given a leaflet had lost it by the time they returned to clinic for cast removal.

Figure 1 The sticker with contact telephone numbers and a QR code

Figure 2 The roll of tape for applying to a plaster backslab: We found a sticker had unreliable adhesion to backslabs. A roll of tape has thus been developed which is wrapped around on itself. This is done gently so as to prevent issues of constriction

Discussion

To our knowledge, the use of a QR code sticker for advice about cast problems has not been implemented previously. Our results indicate that this is an effective tool in the proactive management of cast problems and that it reassures patients.

Having an email address and information accessible online is commonplace in other industries. Supermarkets, coffee chains, energy suppliers and price comparison websites all provide customers with easily accessible information about their services online. Healthcare should be no different. One of the six principles of NHS England's *Five Year Forward View* is producing care that is patient centred, personalised and coordinated.⁶ In addition, it specifically identifies the need for healthcare providers to build capacity for patients to access information using smartphone technology. All of these are issues that the QR sticker seeks to address.

The General Medical Council clearly states that medical professionals have a duty to provide patients with information that helps them understand their treatment.⁷ Applying

the QR sticker to casts provides an extra method of obtaining information away from the hospital. Accessing the data does require a smartphone with a QR code reader application and internet access. For some people, this may be a barrier but in 2016, 89% of UK Households had access to the internet, with mobile phones now being the most popular way to access it.⁸ Among people aged over 65 years, there has been a 3% year-on-year increase in internet usage, with 52% now using the internet. This age group has also seen a large increase in the proportion of those accessing the internet on a smartphone (33%), which correlates with the proportion of our patients aged over 65 years who had a smartphone (35%).

A 2016 survey by the Office for National Statistics found that 51% of respondents searched for information on healthcare, which was the fifth most searched topic overall.⁹ Healthcare has seen one of the largest increases in searches since the 2007 survey, when only 18% searched for healthcare information. This demonstrates that technology use is increasing rapidly across the UK population and people of all ages are using online resources for healthcare more frequently. The results from our questionnaire are comparable with the data published by the Office for National Statistics and Ofcom.^{8,9}

Nine per cent of patients contacted the plaster team with a problem involving their cast. Unfortunately, it is not possible to determine whether this figure was lower or higher as a result of the contact details and QR code being readily available. A third of smartphone owners used the code and all found the information useful. This correlates reassuringly with the high DISCERN rating for the information on the website. The website has educational videos and information about rehabilitation as well as on how to deal with common cast problems, thereby potentially saving patients a visit to hospital.⁵

All of the patients had a sticker applied when their cast was fitted and 97% returned to clinic with the sticker in situ. This demonstrates that the sticker is a reliable method to distribute and provide information. While the paper handout may offer more immediate and readily accessible information to patients, there were a number of potential issues with this as a sole information source. Only 80% of patients said they had received a leaflet when their cast was applied and only 80% of these still had it when they returned to clinic. Furthermore, a previous audit had found that in some units in our trust, information leaflet handout was as low as 10%.

The majority (84%) of patients were reassured by the presence of the sticker on their cast. This figure is much higher than the proportion of patients who could scan the

QR code as only 56% had a smartphone but there were also telephone numbers on the sticker for patients seeking verbal advice. The general feedback from patients, even those without a smartphone, was overwhelmingly positive. Patients thought the sticker was 'innovative' and a 'great method of providing me with information'. Often a high volume of information is shared during a medical consultation and it has been shown that as little as 14% of verbal information is retained by a patient.¹⁰ The QR code is a tool that can help supplement the verbal information supplied by the healthcare professional. A greater understanding leads to a more successful patient relationship and ultimately better, shared decision making.

Although this innovation has been used for an orthopaedic purpose in our trust, the principle could be applied in many other branches of medicine to improve patient care. Catheter placements in urology, stoma bags in general surgery, inhaler delivery devices in respiratory medicine, exercise demonstration in physiotherapy and wound dressings in plastic surgery could all benefit from a QR code. Simple troubleshooting of problems and patient education about their device can all be provided through such a code.

There are, of course, limitations to this investigation, which is an assessment of practice and not a randomised controlled trial. Nevertheless, the positive impact identified in this study indicates that further research and development in this area is warranted. Following the initial success of the QR code sticker in our unit and in keeping with the aims of NHS England's *Five Year Forward View*, a broader portfolio of online information is now being developed, utilising the QR code as an access portal.

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