



## Clinical education

## Just in time? Using QR codes for multi-professional learning in clinical practice

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## ABSTRACT

Clinical guidelines and policies are widely available on the hospital intranet or from the internet, but can be difficult to access at the required time and place. Clinical staff with smartphones could use Quick Response (QR) codes for contemporaneous access to relevant information to support the Just in Time Learning (JIT-L) paradigm. There are several studies that advocate the use of smartphones to enhance learning amongst medical students and junior doctors in UK. However, these participants are already technologically orientated. There are limited studies that explore the use of smartphones in nursing practice. QR Codes were generated for each topic and positioned at relevant locations on a medical ward. Support and training were provided for staff. Website analytics and semi-structured interviews were performed to evaluate the efficacy, acceptability and feasibility of using QR codes to facilitate Just in Time learning. Use was intermittently high but not sustained. Thematic analysis of interviews revealed a positive assessment of the Just in Time learning paradigm and context-sensitive clinical information. However, there were notable barriers to acceptance, including usability of QR codes and appropriateness of smartphone use in a clinical environment. The use of Just in Time learning for education and reference may be beneficial to healthcare professionals. However, alternative methods of access for less technologically literate users and a change in culture of mobile device use in clinical areas may be needed.

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## 1. Introduction

Healthcare professionals are charged with delivering high quality, safe and reliable care. To support this in the UK National Health Service (NHS), electronic access to protocols, clinical policies, and evidence-based guidelines is now commonplace in NHS hospitals. This is usually via an 'intranet' on a desktop PC, and the volume of potential information is vast. This means that although relevant clinical information is available, it can be difficult to access conveniently at the point of need, requiring a login to a desk mounted workstation away from the point of care, and the use of search tools or digital filing systems to find the relevant information. Smartphones may be the solution to delivering relevant clinical information in a timely and convenient way (Davies et al., 2012). Smartphones are now the most popular devices for getting online with 66 percent of the UK adult population owning a smartphone (Ofcom, 2015). Smartphone mobile devices use a

mobile operating system enabling advanced computing capabilities and connectivity, allowing instant access to relevant information from internal storage or outside networks, just when it is needed. Smartphones can store and provide timely information to the user wherever they may be and can be kept constantly up-to-date as the resources they access can be held centrally – the version the user accesses is always the most recent one. Furthermore, functionality can include the ability to incorporate location, task, or user-specific information, making the information provided highly relevant, and just in time to assist with the current task.

The concept of "Quick Response" (QR) codes began at a Japanese Toyota plant where QR codes were used to track inventory in order to improve production efficiency (Rouillard, 2008). This concept provided necessary materials only when they were required, in the correct quantity and at the correct time. QR codes are two-dimensional bar codes that encode a small amount of text, usually a web address, which automatically redirects the smartphone web browser to a relevant object or place (Educause, 2009). QR codes can facilitate easy access to information by linking the physical world to electronic resources like mobile devices

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(Ramsden, 2008). The affordances of QR codes now enhanced by utilising a smartphone camera has a huge potential in a healthcare setting where technology is revolutionising the delivery of services. In addition, Sago (2011) state that mobile devices like smartphones can utilise QR codes to bridge the gap between traditional methods of retrieving information and the digital realm. Conversely, the use of smartphones to access information embedded in QR codes can facilitate the 'Just in Time' (JiT) Learning paradigm.

The concept of or the phase "Just in Time Learning" is derived from Industry where training is offered to relevant workers at the point of need (Baruah, 2013). Here workers are bound to retain knowledge and skills because of the immediate need for productivity. Ellinger and Brandenburg (2003) assert that JIT learning is now enhanced by advances in technology. In this respect, mobile devices like smartphones can be used to facilitate Just in Time learning by providing ubiquitous learning opportunities which allow learners to access pertinent learning material at the precise moment of need.

Mobile devices like smartphones are advanced tools that allow instant access to enormous amounts of information, but they can only respond to what is entered hence users require digital literacy. Anyone with a smartphone can search on a clinical topic and thousands of sources can appear, but finding high quality information within this is an advanced skill, and further, is time-consuming. Access to Google on a smartphone does not make the user information-literate. Thus, to allow Just in Time learning to occur, an additional tool is required to connect the moment of activity to the relevant learning material.

## 2. Background

Traditional means of accessing learning material in a healthcare setting is through education providers, computers, clinical stations and libraries. However, QR codes should not only enhance the availability for these traditional means but act as proxies that are available at the point of care. Hicks and Sinkinson (2011) explored the implementation of such a concept at university libraries and their conclusion reveal the potential benefits of using QR codes to bridge the gap between the virtual and physical library services. Similarly, this study will use QR codes to provide the healthcare professionals with valid information that can be accessed at the point of care.

The Darzi report *High Quality Care For All*, puts emphasis on the provision of clinically effectiveness, enhanced patient experience and patient safety (Department of Health (2008)). This is also echoed by the Francis (2013) which recommends high quality, compassionate care. This has resulted in several nurse educational changes in the UK especially the development of innovative educational initiatives that directly benefit patient's outcomes. However, it is evident that nurses remain uncomfortable about the use of technology in practice (Di Pietro et al., 2012; Kuo et al., 2013). Both studies highlighted the importance of continuous educational programmes that can enhance technology literacy and disperse discomfort about the use of technology in nursing practice.

The use of QR codes in higher education is on the rise, yet there is very little literature about their use in clinical practice. Feasibility and accuracy of QR codes is highly evaluated for other functional roles in healthcare practice (Lin et al., 2012; Dixon et al., 2013). On the other hand, McAllister et al. (2013) advocates the use of QR codes to orientate nursing students to clinical skills through videos with practical guidance. This provides nursing students with direct access to pertinent learning material in a simulation suite. However, the same principles can be extended in a clinical setting for nurses and other healthcare professionals.

Although the use of smartphones is not a new phenomena in a healthcare setting (Ismail et al., 2012; Payne et al., 2012 and Mosa et al., 2012), a consensus on the use of mobile phones in a clinical setting remain ambiguous in NHS hospitals. The use of mobile phones is restricted in most clinical areas due to often vague concerns about interference with medical equipment, privacy or distracting noise in a therapeutic environment. A study by Dearnley et al. (2006) found that some midwife students did not use the PocketPCs that they were issued for the study because they anticipated restrictions whilst others were told by their practice mentors to refrain from using them in front of clients. Payne et al. (2012) acknowledge that the impact of using smartphones in a clinical setting may pose negative effects on patient-healthcare staff relationship because of public perceptions regarding this practice. This is also recognised from the study by Ismail et al. (2012) which advocates the use of smartphones by healthcare providers at the point of care with the intention to reduce medical errors.

The implications for smartphone use to retrieve instantaneous information through QR codes at the point of care could prevent healthcare practitioners from making 'trial and error' decisions hence benefit clinical outcomes. A systemic review by Mosa et al. (2012) reveals that the use of smartphones can benefit both healthcare practitioners and patients. This is also supported by Payne et al. (2012) who found that medical students and junior doctors supported the idea of using smartphones to facilitate learning in clinical practice. Ultimately, such devices can benefit all healthcare professionals. Sago (2011) confirms that smartphone ownership is well represented across demographics hence this study will assume this is reflected in a clinical setting.

The use of QR codes embedded with clinical information to facilitate Just in Time learning for healthcare providers is a fairly new concept. Although a systemic review by Mosa et al. (2012) indicate widespread (a total of 55 articles) use of smartphones by healthcare professionals, it was solely focused on the use of mobile phone applications as the tools of choice. However, the successful implementation of QR codes in the academic library setting at the University of Colorado at Boulder (Hicks and Sinkinson, 2011) and the effectiveness on QR codes in a study by Sago (2011) confirms the notion that the functionalities of QR codes extend beyond all expectations. Therefore, an initiative that embraces such advances in mobile technology deserves further exploration.

## 3. Aim and objectives

### 3.1. Aim

The aim of this study was to evaluate the effectiveness, acceptability, and the feasibility of QR codes for multiprofessional Just in Time learning in a clinical inpatient environment within a UK NHS hospital. Our working hypothesis was that clinical staff, already equipped with smartphones, could use QR codes to provide rapid access to trust-approved, curated, relevant learning directly within the workplace, thus enabling the Just in Time learning paradigm.

### 3.2. Objectives

- To explore the effectiveness of QR codes in facilitating Just in Time learning in clinical practice;
- To ascertain the perceptions and acceptability of QR codes as a method of facilitating Just in Time learning;
- To establish the feasibility of QR codes as technology enhanced learning resource.

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