An acute knee injury: tracking a two-year recovery online

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Abstract: Current government policy aims to deliver high quality healthcare by recording accurate data at the point of giving care, storing it efficiently and displaying it in a format, which is easily interpreted by healthcare professionals and patients. Few published reports describe the benefits of collecting and reporting such data from the point of view of the patient. We report the case of a 62-year-old lorry driver who used a web-based system to track patient reported outcome measures (PROMs) following an acute knee injury to full recovery over a 24-month period. The system reports clinical outcome scores in real-time to the patient and their medical team, clearly illustrating and enhancing recovery from injury. This case reveals how local software meets the needs of the individual patient linking and integrating such local systems must be the future focus of eHealth within the NHS to release the benefits presented by the information revolution.

Keywords: acute knee injury; information revolution; PROMs; patient reported outcome measures; electronic patient reported outcome measures; electronic healthcare; tracking recovery following injury; national PROMs program; electronic data collection; national program for information technology; Oxford knee score.


Biographical notes: Clare F. Taylor is a Trauma and Orthopaedic Registrar on the Southwest Peninsula rotation in the UK, with an interest in soft tissue knees and sports injuries. She graduated from Southampton University Medical School in 2004 and completed her basic surgical training in the peninsula deanery including six months at the Royal Perth Hospital in Western Australia.
She took up the position of Registrar on the Southwest rotation in 2011 and has developed an interest in knee surgery and sports injuries. On completion of training she would like to undertake subspecialty fellowships in Trauma and soft tissue knee.

Daniel H. Williams is a Consultant Trauma and Orthopaedic Surgeon at the Royal Cornwall Hospital, UK, with an interest in primary/revision hip & knee arthroplasty. He published his Master’s degree thesis on impingement in hip resurfacing arthroplasty and following subspecialty fellowships in Seattle, Oxford and the University of British Columbia, has developed an interest in measuring clinical outcomes. He strongly believes that Orthopaedics worldwide must better measure Patient Reported treatment specific Outcomes (PROMs). His part of a group that’s designed and built the myClinicalOutcomes.co.uk website, a web-based system that enables live and remote analysis of cohort and individual patient data.

1 Introduction

The Department of Health (DH) published ‘Liberating the NHS: An Information Revolution’ in 2010 stating that the delivery of high quality healthcare depends on recording accurate data at the point of giving care, storing the information in an efficient way and displaying it in a format which is easily interpreted by both healthcare professionals and patients. This enables healthcare services to deliver care in a safer and more efficient way, and encourages shared decision-making (Jones et al., 2010).

Patient reported outcome measures (PROMs) comprise validated condition-specific or generic question sets that measure patient symptoms. PROMs have been used in research – as outcomes in clinical trials and economic evaluations – for many years (Appleby et al., 2004; Fung and Hays, 2008; Greenhalgh, 2008; Marshall et al., 2006; Rose and Bezjak, 2009; Snyder and Aaronson, 2009) and have recently migrated into everyday clinical practice (Appleby and Devlin, 2005; Black, 2013; Fung and Hays, 2008; Rothwell et al., 2010; Snyder and Aaronson, 2009).

The National PROMs Program (Department of Health, 2008) started to collect data in 2009 about four procedures (including hip and knee replacement) and has already revealed powerful insights when linked to other datasets (Baker et al., 2012a, 2012b). The challenge now is to enable real-time clinical use of such data across a wider range of clinical conditions and problem areas. This case report demonstrates how the collection of PROM scores, using a web-based system illustrated and enhanced the recovery from an acute knee injury.

2 Case report

A 62-year-old lorry driver was referred for an orthopaedic opinion with symptoms of ongoing right knee pain following a fall from his tanker onto hard ice five months prior to presentation. He was fit and well with no previous problems or complaints affecting that knee or leg. Examination of the right knee revealed flexion from 0 to 120 degrees with mild tenderness over the medial femoral condyle, stable ligaments, a normal McMurray’s test and no distal neurovascular deficit.
The X-ray films showed mild medial joint space narrowing without any obvious bony abnormality (Figure 1). A T2-weighted magnetic resonance imaging (MRI) scan revealed evidence of an undisplaced and incomplete subchondral fracture of the medial femoral condyle with associated bone bruising (Figure 2).

The patient was referred for physiotherapy to improve quadriceps strength and was encouraged to begin low impact cycling. At the same time the patient was asked to register on the web-based system in use at our institution for collecting clinical outcome scores. The patient registered demographic details, completed a condition specific and general well being PROM and consented to share their real-time clinical outcome data with their medical team. The system then enabled symptom scores to be monitored remote from the clinic setting enabling the patient’s progress to be tracked between face-to-face appointments (Figure 3).

**Figure 1** Anteroposterior and lateral X-ray films of the right knee

**Figure 2** Coronal and sagittal T2 weighted MRI images of the right knee
The initial Oxford knee score (OKS) was 24/48 (worst to best 0–48) (Dawson et al., 1998) (Table 1). The patient was reviewed in clinic five months later and was proceeding well with a small improvement in the OKS, slowly building up the quantity of quadriceps strengthening exercises and low impact cycling. At 12 months the patient was cycling on a static bike on a daily basis and apart from occasional twinges of pain over the inside of the knee reported complete resolution of his symptoms; the OKS was 40/48. At final review at 16 months (21 months following the initial injury) the patient was cycling regularly and reported further improvements in his symptoms. The OKS at this time was 37/48 with a howRU score of 10/12 (Benson et al., 2010).

Table 1  Oxford knee score (OKS) (Dawson et al., 1998) and howRU (Benson et al., 2010) recorded over a 24-month period from the initial consultation

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The patient was encouraged to monitor his clinical outcome scores beyond this final review and at 24 months the OKS was 48/48 and the howRU score 12/12. These clinical outcome scores indicated a good recovery and were reassuring to both the patient and the medical team (Figure 3).

3 Discussion

‘Electronic health’ was first defined in 1999 and describes information technology and communication as applied to healthcare (Kadda, 2010; Efstatiou, 2008). The Internet has for some time been used for remote monitoring and industrial process control and virtual laboratories (Al-Rousan et al., 2006) Remote monitoring concepts have migrated into the healthcare sector allowing patients to be monitored away from the clinic setting, while still maintaining a patient centred approach. Remote patient monitoring can be defined as a service that enables physicians to access up-to-date patient status through the use of advanced telecommunication technology (Metaxiotis et al., 2004; Demiris, 2004).

In 2004 the Department of Health launched the NHS National Program for Information Technology (NPfIT) (Hendy et al., 2005), an initiative designed to create a central secure electronic patient record. The aim was to connect general practitioners (GPs) to hospitals while providing patients with access to their online clinical record. The cost of the program ran to some £12 billion and this top-down, one size fits all approach comprehensively failed to meet the local needs of the some 300 NHS trusts and 30,000 GPs. Significant delays, technical difficulties and rising costs led the Health secretary and NHS chief executive to discontinue the program late in 2011. The focus has since turned to the procurement and development of local software solutions with NHS care providers agreeing local IT contracts that address the needs of their local patients and medical teams (Campbell, 2011).

While many articles describe and discuss the benefits of collecting and using electronic data in clinical practice (Appleby and Devlin, 2005; Black, 2013; Fung and Hays, 2008; Rothwell et al., 2010; Snyder and Aaronson, 2009), there are few practical examples describing the advantages of using such data from the patient’s point of view. The case described here reveals how one such system, developed to meet local needs, enabled a patient with a knee injury to track his recovery over a two-year period using clinical outcome scores and to reach an OKS of 48/48 and a howRU score of 12/12. Scoring systems even with a low ceiling effect cannot infer complete recovery but can indicate at least a good recovery when viewed in the context of earlier scores (Jenny and Diesinger, 2012)

The system here also met the needs of the medical team who were able to track the patient’s score away from the clinic in the context of other patients with similar conditions. Aggregated comparison results are available at an individual patient, treatment cohort or specific demographic level. This allows patients with a low or deteriorating outcome score to be brought back for a face-to-face review at an appropriate time point while well patients, such as the patient described here, can be followed at home. To do this, a remote patient monitoring system must allow real-time data transfer, allow multiple doctors to remotely monitor their patients at the same time, allow one doctor to monitor multiple patients at the same time and/or allow a group of doctors to monitor one patient (Al-Rousan et al., 2006). Such a system offers the potential of increased efficiency, personalised attention, enhanced quality and equality of
management to all patients, while taking into account financial pressures placed on patients attending repeated hospital appointments (Kadda, 2010).

This single patient case study points towards what a future well designed study might look like. The assessment of recovery in this study beyond 21 months post-injury was based only on the OKS and howRU scores. The howRU is a short generic measure of health related quality of life that measures how the patient is feeling physically and mentally, and how much they can do in terms of function and independence. It was designed with electronic data collection in mind and has been validated against the Short form-12 (SF-12) (Ware et al., 1996) score at the aggregate level (Benson et al., 2010).

The OKS is a 12 question PROM specifically designed and developed to assess function and pain after total knee replacement (TKR). While the OKS is reliable and validated only when used in patients undergoing TKR surgery (Dawson et al., 1998); the Oxford scores (both hip and knee) have now been used widely for evaluating other interventions (Clarke et al., 2005; Reilly et al., 2005; Weale et al., 2001) including trauma (Mishra et al., 2004). Trauma scoring systems are available for use in the initial assessment of major trauma patients, to aid with resuscitation and ongoing acute management, and specific trauma outcome scores, mainly record survival, length of hospital stay, complications, and general health status (Revell et al., 2003). Further work using existing PROMs is therefore required or new measures require development to assess pain and functional recovery from episodes of trauma. Making use of web-based collection could speed up this work.

This case reveals how one web-based system, developed to meet local needs, enabled a patient with a knee injury to track his recovery over a two-year period. Linking such successful local systems to established national programs is now required to meet the vision described in the DH’s 2010 paper ‘Liberating the NHS: An Information Revolution’ (Jones et al., 2010). Linked cost-effective systems would enable patients and their medical teams to access powerful national data, allowing cohort comparison and empowered decision making. Electronic healthcare as originally described by Eysenbach (Efstathiou, 2008).

References
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