

In this study, we have sought to elucidate information management processes within the patient surgical pathway from primary to secondary care in the National Health Service for Scotland (NHS Scotland).

Background

NHSScotland¹ is organised into 14 territorial health-boards, overseeing the provision of primary and secondary health-care services in the region, as well as having the responsibility to implement national policies at the regional level. The *Better eHealth: Better Care programme* (2008–2011) aimed to promote more efficient use and sharing of patient data and clinical information throughout NHSScotland [1]. The programme sought to support an environment which would facilitate iterative steps towards a virtual Electronic Patient Record (EPR) through the development of expertise in electronic health systems throughout NHSScotland. It also sought to establish clear information governance for safeguarding patient information integrity and confidentiality, and to support integration and interoperability of core electronic systems. Key elements of the strategy included establishing a unique electronic-based patient identification system throughout the NHS, and providing “clinical portals,” as access points to heterogeneous clinical data repositories [2].

Electronic Information Management in NHSScotland

General practices in Scotland have been using Electronic Medical Records Systems (EMR) within their practices routinely for many years. GP practices require systems that allow them to coordinate the care of patients, by efficiently managing patients' medical records. Systems also need to facilitate information-sharing between treating GPs as well as information transfer to other NHS care providers [3, 4].

The multiple steps involved in referral processes from primary care services to specialist secondary care services were identified as important factors of delay in patient care. In 2008, electronic referral (eReferral) management from primary to secondary care was identified as a key enabler of the 18 weeks Referral-To-Treatment (RTT) target². The target set a maximum of 12 weeks for a patient to be seen at an outpatient clinic from the time of the initial referral [5]. eReferral was defined as a key strategic eHealth policy priority under the NHS HEAT (Health, Efficiency, Access and Treatment) target programme. Recent figures estimated that in January 2011, the rate of electronic referrals across Scotland was 98.8% and that the electronic management of referrals (eTriage) was 81.4%³. The eReferral ratio refers to the proportion of referrals which are sent electronically from primary care providers to secondary care services, while the eTriage ratio refers to the proportion of referrals which are managed electronically in hospitals from then on, as opposed to being printed-out and involving further paper-based processes.

The eHealth programme has adopted portal server technology as an iterative strategic technology solution towards a virtual EPR. Portal technology is an internet-based content aggregation method. It provides information and functionalities as a single point of access by collating data from heterogeneous electronic repositories within the NHS [2, 6]. The long term vision is to integrate all national and local applications within NHSScotland into portal technology, so that a majority of system applications and information will be accessed via the portal. This will gradually replace local implementations and ad-hoc systems. The total cost of portal technology development

across NHSScotland was recently estimated to be £10 to £15 million⁴.

Preoperative Assessment

Pre-operative assessment (POA) is a clinical investigation taking place between a patient referral for surgery and the actual surgery itself. POA is by nature a clinical “bottleneck” process composed of a discreet chain of clinical investigations. Each of the sub-processes may involve different members of a multi-disciplinary medical team (MDT): specialised pre-operative nurses, doctors, surgical or anaesthetist consultants, and professionals from various medical disciplines, as well as clerical staff handling administrative duties. A patient POA can vary from a straight-forward medical formality to a very complex chain of clinical processes. When clinical concerns are raised early on, the assessment may require the elucidation of a comprehensive patient medical history. Information required will generally include: a comprehensive list of comorbidities, a history of previous surgery, medication, family history, allergies and previous experiences of clinical adverse events [7]. To optimise clinical resources, it is important that a triage system be in place in order to quickly distinguish between patients who only need minimal assessment vs. those who will require more substantial investigations [8].

Materials and Methods

Ethical approval for this study was obtained from the University of Glasgow College of Medicine ethics committee in February 2010. We visited surgical PACs in all 14 health-boards of Scotland. We carried out semi-structured interviews with key members of the preoperative MDT (n=45, between April 2010 and January 2013) and with GPs from 9 health-boards (n=25, between February 2012 and January 2013). We conducted one focus group with members of the Electronic Patient Record Programme, one focus group with GPs, and one interview with a senior SCI Gateway system developer. With over 70 respondents across 14 health-boards, this is effectively the single largest study of information management processes in the patient surgical pathway in NHSScotland.

Data Collection – Primary care

We conducted in-depth semi-structured interviews, digitally recorded with the explicit consent of each individual respondent. All interviews were open-ended in order to allow the interviewer or interviewee to elaborate on unanticipated and potentially valuable information with additional questions, and probe for further explanation [9]. Interviews were then transcribed verbatim. The interviews aimed to collect GPs' views around 5 core themes: 1) information about the GP practice itself, including their EMR system and ICT use, 2) the patient consultation and the referral process to hospital outpatients' clinics, 3) communication between GPs and hospitals from the point of referral to patient surgery, 4) post-operative discharge information provided by the hospitals, and, 5) issues identified in the patient surgical journey and areas for service improvement.

² <http://www.18weeks.scot.nhs.uk/>

³ http://www.ehealth.scot.nhs.uk/?page_id=482

⁴ <http://archive.scottish.parliament.uk/s3/committees/hs/reports-10/her10-03.htm>

¹ <http://www.scotland.gov.uk/Topics/Health/NHSScotland>

Data Collection – Secondary care & eHealth Programme

The aims of these visits was to interview key members of the PAC, including the senior nurse, the clinical lead (consultant anaesthetist), and other members of the service as feasible. In addition, we collected all relevant POA documentation which was provided to us by the PAC staff. The interviews aimed to collect respondents' views around the following themes: 1) interviewee's background, 2) overview of the PAC, 3) key steps within the patient preoperative pathway, 4) patient medical history collection, 5) screening, risk assessment and the use of protocols and guidelines, 6) roles and responsibilities within the MDT, 7) parallel processes (*i.e.*, referrals to other services), and, 8) information management and usage processes.

Data Analysis

We analysed data collected from the PACs using process-mapping techniques and qualitative data analysis. A process map is a visual representation model of a set of clinical services [10, 11]. Process mapping may diagnose structural problems in the running of services, or highlight aspects of services which are performing well and can aid professionals to understand how services are perceived by outside agents. We analysed all transcripts using an electronic health systems quality assessment framework [12]. The framework is derived from De Lone & McLean's model of quality in information systems [13].

Results - The Patient Surgical Pathway

A model of a generic patient surgical pathway in NHSScotland, including the flows of information between primary and secondary care providers and patients, is described in Figure 1. There are local variations to this pathway depending on specific practices in the regional health-boards; however, the model represents a fairly accurate depiction of what takes place across the NHS in Scotland.

- 1) During the patient consultation, if the GP considers that the patient needs to be seen by a specialist in secondary care, he will send an electronic referral through the national eReferral system. SCI Gateway is a protocol-driven system. The referral protocols are developed by the local health-boards in order to best meet the information needs of the regional Acute Care Hospitals and surgical specialty departments [4]⁵.
- 2) The referral will be triaged at the health-board level. If the referral is assessed as justified on clinical grounds, it will proceed to the appropriate hospital waiting list system for the allocation of an appointment within the specified outpatient department.
- 3) Once an appointment is available at the outpatient department, the patient is then contacted via a postal letter. Primary care providers are not usually routinely notified of this appointment, although they will be informed if the patient misses an appointment. The patient may also call the appropriate clinic to notify them if he is not available for the original appointment date specified in the letter. Several GPs, particularly in large urban centers such as Glasgow, raised the issue that it was not uncommon for patients to have moved addresses since the initial referral. Therefore, a reason for non-attendance at the clinic could simply be the patient being unaware of a scheduled appointment.

4&5) Once the patient has attended the outpatient appointment, if the specialist decides to proceed with surgery, then the patient will be entered into the hospital surgical PAC waiting list. The specialist will then send a clinical letter to the primary care providers, which typically takes several weeks to reach the GP. It is not unusual at this stage for a patient to visit his GP to provide some feed-back about the patient appointment, while the GP would not yet have received any communication from the hospital. Occasionally, the GPs will ring the clinic to get specific information regarding their patient case management plan.

6) Once an appointment is available at the PAC, the patient will be notified by postal letter. The outcome of the patient assessment is usually one of three: (i) the patient can proceed to surgery and is entered in the surgical department waiting list, (ii) further investigations or interventions are necessary and the patient status is pending the results of these interventions, or, (iii) the patient is not fit for surgery and an alternative patient management plan will be discussed with the primary care team.

7&8) If the patient is fit for surgery, the patient will undergo the surgical procedure within the 18 weeks RTT. Once surgery has been completed and the patient is fit for discharge, he is handed an immediate discharge letter upon leaving the hospital, which can be either a carbon-copy of a handwritten letter or a typed letter. This is a very succinct clinical letter which will name the surgical procedure undergone and details of medication which the patients needs to take post-operatively. Primary care providers are not routinely sent a copy of the immediate discharge letter but some departments will also fax a duplicate to the GPs.

9&10) A full discharge letter is subsequently sent to the GPs. This is a complete clinical letter which is dictated by the surgeon who carried out the operation. As it is typed by surgical secretaries it can take several weeks — or even in some cases months — before it is received by the GPs. The patient will usually visit his GPs some time after the surgery and hand over the immediate discharge letter to his GP. If the full discharge letter has not yet been received by the GP, then this brief letter can be the only information available to the primary care provider at this stage.

We now present evaluation results along the following 4 dimensions: (i) information management in primary care, (ii) electronic referral, (iii) information management at the pre-operative clinic, and finally, (iv) patient discharge.

Information Management in Primary Care

The use of EMR systems within primary care is now universal in NHSScotland, with 2 accredited systems in use as of March 2012: EMIS⁶ and Vision⁷ [3]. The EMRs are clearly viewed as an essential and integral part of GP work during the patient consultation. However, levels of satisfaction are mixed due to concerns regarding system functionalities and limitations. In addition, many GPs seemed unsure of how to best use certain functionalities of the systems, which could clearly have negative implications for the accuracy of the information contained in the patient medical record [14, 15]. Considering that information contained in primary care records is used to populate the Emergency Care Summary (ECS) [2], which is used in episodes of unscheduled care, the implication of even partially

⁵ http://www.sci.scot.nhs.uk/products/gateway/gateway_prot_library.htm

⁶ EMIS <http://www.emis-online.com/>

⁷ INPS <http://www.inps4.co.uk/>

inaccurate records in patients' records could potentially lead to patient harm.

Electronic Referral

SCI Gateway is a national electronic referral system developed by the Scottish Care Information (SCI) group, which is part of the Information Services of NHSScotland. SCI Gateway is designed to handle e-referrals directly from patient records held in GP systems and transferring these to secondary care systems, as well as handling shared care information and hospital discharge communications⁸. SCI Gateway was perceived to have provided substantial improvements in streamlining referral processes and facilitating the tracking of referrals to secondary care. There remain important issues with the usability, functionalities, and broader issues of referral handling throughout the national eReferral system. However, the respondents in our study have demonstrated that the system has been successfully deployed because the overall perceived benefits significantly outweigh any drawbacks [4].

The main reasons cited for the approval of the system included: usefulness, usability, and improvement in processes. The improvements included speed of referral transfer and the standardisation of referral protocols. The main grievance was related to the lack of feedback on referral progress after the initial referral had been sent. However, this is not directly due to problems with the system itself, but in fact due to clinical processes in secondary care. Once the hospital has received a referral, it communicates directly with the patient. The GP is no longer involved at this stage until he receives a letter from the outpatient clinic (see Figure 1). Although GPs generally did not want to be inundated with e-mail notifications about patients' appointments, they would often prefer to be able to check the status of referrals when patients come to enquire about the progress of their referral. As a matter of fact, SCI Gateway includes such functionality. It provides information on a referral request, such as whether it has been received and read. The issues here were thus multifold: some GPs did not seem to know about this functionality; others did but argued that knowing that a referral had been read did not give any indication as whether it had been acted upon and how long it would be before a patient would be seen at the outpatient clinic. The SCI Gateway system developer we interviewed was aware of this issue and again emphasised that this was essentially a clinical process issue and not a technical issue. The system itself has the means to convey this information to GPs, but hospitals do not generally provide it to the system. The lack of feedback from secondary care was therefore a common complaint among GPs.

Preoperative Assessment

Most preoperative services in NHSScotland were created in the last ten years to reduce late theatre cancellations and increase the ratio of day-case surgery. Services were designed based on available evidence, national and local guidelines, and examples of best practices. Processes varied significantly across services in terms of organisation of services and data collection methods. All the services were nurse-led. In fact, nursing was the only health profession consistently represented across the various services. Several PACs had regular anaesthetist-led clinics, and this was perceived by both the nurses and anaesthetists as promoting good communication among the MDT and robust structures for patient-case management. Three health-boards have now implemented preoperative elec-

tronic systems: NHS Dumfries and Galloway (D&G), NHS Greater Glasgow & Clyde (GGC), and NHS Tayside. NHS GGC developed a comprehensive preoperative clinical portal with considerable support from the Scottish government eHealth programme (eForm). The electronic portal enabled nurses to complete a preoperative assessment in the patients' local hospitals. This in turn allowed clinical consultants to subsequently access the documents remotely from multiple sites. This was perceived as a substantial improvement, as patients around the Glasgow health-board routinely have their surgical pre-assessment and surgery at different hospitals, depending on surgical specialties. NHS D&G developed an in-house preoperative electronic form in 2008, with the aim of creating a paperless PAC. Despite initial reservations from the nurses, — mainly due to a lack of IT literacy and concerns about the potential impact on the patients' experiences — the nurses fully adopted the system within a few months. They declared during interviews that they would never consider returning to paper-based processes. The third POA electronic system implemented in 2012 at the PAC of Ninewells hospital in NHS Tayside can be described as a "hybrid" implementation. The nurses still use a paper-based integrated care pathway during the patient assessment. The paper documentation is then scanned and uploaded on the clinical portal using unique electronic identifiers, including the patient Community Health Index (CHI) number [2]. The hybrid implementation provides some of the benefits of digital documentation (*e.g.*, traceability and access) but not the full benefits (*e.g.*, EPR search and query, clinical coding and audit). However, a full POA system implementation based on electronic portal technology is planned for the near future and is now in the advanced stages of design. A full system roll-out is expected in the course of 2013. Overall, the MDTs at these 3 services reported improvements in clinical processes. However, clinical benefits for patients have yet to be evaluated. There is an overall lack of evaluation of PAC services effectiveness across NHSScotland. Other services were also keen to adopt preoperative electronic systems, although this entailed the need for additional resources to allow for service redesign. Smaller health-boards had not immediate intentions to adopt these systems and the cost-benefits were less clear due to the lower volume of patients who are seen by these services.

Patient Discharge

Post-operative discharge information provided to GPs was deemed overall unsatisfactory. Almost all GPs interviewed reported a substantial variability in the quality of discharge information, with some letters still handwritten and GPs receiving an illegible carbon copy. Thus, it was not unusual for GPs to have to phone hospitals to receive confirmation of the information contained in the discharge letter. Delays could also be significant, ranging from several weeks to several months. In addition, the immediate discharge letter is often handed directly to the patient, and not always copied to the GP. It is not unusual for patients to return home after surgery without informing their GPs that they have been discharged. Since the GPs often do not know that the patient was scheduled for surgery in the first-place, they may not know that the patients have had surgery at all until several months later, either after receiving the full discharge letter or following the patient presenting at the practice for an entirely separate matter. Overall, the situation was clearly deemed unsatisfactory. GPs did not understand why discharge letters were not sent electronically as themselves did with referral requests. Again, the member of the SCI Gateway development group we interviewed explained that the SCI Gateway had the functionality

⁸ http://www.sci.scot.nhs.uk/products/gateway/gateway_main.htm

to handle electronic discharge letters, but that the issue was centred on the organisation of the discharge process in hospitals. This generally involved a junior doctor in the surgical ward — not directly involved in the care of the discharged patients — being responsible for writing the immediate discharge letters. The full discharge letter is later dictated and recorded by the surgeons. It then takes another several weeks for these recordings to be typed and sent back to the GPs. A range of factors thus affected the quality of the discharge information, including: the quality of the consultant feedback, how busy the surgical service was, and the quality of support and secretarial staff.

Conclusion

Substantial progress has been made towards improving information transfer and sharing within the surgical pathway. A sustained national effort put into policy building, along with engagement with stakeholders, have been key factors in the successful implementation of national and regional eHealth implementations and services (*i.e.* eReferral, the electronic clinical portal). On the other-hand, barriers to the full integration of information across the patient pathway remain. These include a lack of IT training among primary care practitioners, a lack of inter-professional collaboration and communication around the development of referral protocols, and the lack of integration of electronic information systems in hospitals. Additionally barriers include the lack of effective utilisation of referral information during POA and finally the poor coordination of discharge documentation across services. Thus, promoting increased communication, understanding and cooperation at the interfaces between services is essential to optimise the transitions and effectiveness of processes across the patient surgical pathway.

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References

- [1] Better eHealth: Better Care, Scottish Government report, 24 p., 2008.
- [2] Bouamrane, M.-M. & Mair, F.S. An overview of electronic health systems development and integration in Scotland. In Proceedings of Managing Interoperability and Complexity in Health Systems, MIXHS'11, 20th ACM Conference on Information and Knowledge Management, CIKM 2011, Glasgow, U.K., ACM, 2011, 59-62
- [3] Bouamrane, M.-M. & Mair, F.S. A study of general practitioners' perspectives on electronic medical records systems in NHSScotland. BMC Medical Informatics and Decision Making 2013, 13:58
- [4] Bouamrane, M.-M. & Mair, F.S. Evaluation of a nationwide protocol-driven electronic referral system. 2013, under peer-review.
- [5] The Referral to Treatment Standard: 18weeks. Scottish Government report, 41p, 2008.
- [6] C. Wege. Portal server technology. Internet Computing, IEEE, 6(3):73 –77, May/Jun 2002.
- [7] Association of Anaesthetists of Great Britain & Ireland (AAGBI): Pre-operative assessment and patient preparation. The role of the anaesthetist. The Association of Anaesthetists of Great Britain and Ireland; 2010.
- [8] Bouamrane, M.M., Tao, C., Mair, F.S. Managing complexity in pre-operative information management systems. Proceedings of Managing Interoperability and Complexity in Health Systems, MIXHS'11, CIKM 2011, Glasgow, U.K., ACM, 2011
- [9] Kaplan, B. & Maxwell, J. Qualitative Research Methods for Evaluating Computer Information Systems. In: Anderson, J., Aydin, C., eds., Evaluating the Organizational Impact of Healthcare Information Systems; chap. 2. Health Informatics; Springer New York; 2005: 30–55.
- [10] NHS Modernisation Agency. Process mapping, analysis and redesign, Improvement- Leaders Guide 42p. Tech. Rep.; 2005.
- [11] Bouamrane, M.M., McGee-Lennon, M., Brewster, S., Mair, F.S. Using process-mapping to design integrated health information management systems. In Proceedings of the 24th International Symposium on Computer-Based Medical Systems (CBMS), 2011. 1-6.
- [12] Bouamrane, M.-M., Tao, C., Mair, F.S. An overview of electronic health information management systems quality assessment. In: Proceedings of Managing Interoperability and Complexity in Health Systems, MIXHS'2012, CIKM 2012, Maui, USA. 2012
- [13] Delone, W.H., McLean, E.R. Information systems success: The quest for the dependant variable. Information Systems Research 1992;3(1):60–95.
- [14] Short, D., Frischer, M., Bashford, J. Barriers to the adoption of computerised decision support systems in general practice consultations: a qualitative study of GPs perspectives. International Journal of Medical Informatics 2004;73(4):357 – 362
- [15] Avery, A.J., Savelyich, B.S.P., Sheikh, A., Morris, C.J., Bowler, I., Teasdale, S. Improving general practice computer systems for patient safety: qualitative study of key stakeholders. Quality and Safety in Health Care, 2007;16(1):28-33.

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