Evaluation of the MediData eMR software for use by General Practices

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Executive Summary

Background

Rising demand, changing patterns of work by General Practitioners, a fall in the proportion of funds allocated to general practice along with reports of higher levels of stress and lower satisfaction with practising medicine by UK GPs tells us that UK primary care organisations are in crisis, with unsustainable GP workloads. In addition to their NHS work GPs increasingly receive requests for medical information about their patients by third parties (e.g., employers, government agencies, insurance companies, regulatory bodies and others) as they hold the most comprehensive patient records. Although the production of third party medical reports can be a valuable source of income where NHS funds are low, it is also an additional drain on already stretched practice resources, with report returns frequently delayed. GPs want to spend more time with their patients and support is needed to facilitate this. Health technology and specialised software solutions are increasingly being offered to promote effective ways of working within primary care as well as the wider health care system; however, there are reports of differing success in regards to the adoption, application and effectiveness of the available technology, often related to the extent of end user consultation and involvement throughout the design, development and implementation process of such systems.

MediData eMR Software

Satisfaction with electronic medical records (EMRs) has been found to be positively correlated with how stressful GPs find their job. Knowing that improved access and better use of health technology may offer additional benefits, as well as administrative assistance, MediData are developing a software solution, eMR, with the end users firmly in mind. The eMR is being designed and co-produced through explicit consultations with relevant stakeholders, such as GPs, medical record and patient data management systems (e.g. EMIS) and industry views from Health Technology Consultancies across the UK. The eMR aims to reduce GP time spent on medical report completion, speed up the time of report returns, ease and strengthen GPs provision of essential data only, thus benefiting GPs as well as patients and third parties. These objectives are met through the core functionalities of the eMR, i.e., an effective automated redaction process based on pertinent information being requested via specific medical codes; the option to add relevant context and narrative, allowing GPs to concentrate on the areas requiring their expertise and patient knowledge (rather than spend time scanning patient data); explicit patient consent; and report formatting that meets all the current standards for medical reporting, thus reducing the risk of GPs including inappropriate data by mistake and facilitating General Data Regulation Protection adherence..

MediData eMR Software Evaluation

The eMR software was piloted across nineteen General Practices in South Wales (n=15) and England (n=4) between February and March 2018. An evaluation of the eMR was undertaken by Swansea Centre for Health Economics and Evaluation (SCHE) alongside the software trial.

eMR Trial

The software trial included access to the eMR software via the GPs existing desktop systems. During the eMR test phase participating GPs were asked to complete six patient medical reports using ‘dummy’ data; instructions for the medical report request was provided along with training material detailing how to use the MediData eMR software, i.e., a written information sheet with step by step instructions and screenshots and an instructional video. To test the system ‘dummy data’ in form of three fictitious patients were specifically created for the trial; each GP received six instructions, two for each of the ‘patients’, including a list of conditions of interest, where only medical information relevant to those conditions should appear in the final report. The GPs’ task was to use the eMR platform to prepare a medical report for each instruction, containing only information relevant to the sought-after conditions in the instruction. The eMR platform subsequently extract data from the ‘patient’s’ master medical record held in the EMIS electronic medical record. The eMR platform then performs an automated

redaction based upon the SNOMED CT hierarchy of medical disorders. The automatically redacted report becomes available to the GP via an intuitive interface; the system allows the GP to redact further information, or append missing information.

eMR Evaluation

Swansea Centre for Health Economics (SCHE) was commissioned by MediData to evaluate the eMR pilot across GPs. It was proposed that the evaluation by SCHE would take place in two phases; reported herein is phase 1, an initial exploration of GPs experiences of the eMR software; this work is expected to lead into Phase 2 which will be an evaluation of the software across a wider stakeholder group once implemented across the UK. The evaluation from phase 1 included **i) a clinical and technical report,** prepared by an independent assessor, based on the qualitative analysis of twelve randomly selected medical reports produced in the eMR trial that were compared with a 'gold standard' model report; **ii) an online survey facilitated by MediData**, with focus on the software functionality and significances for its use; there were seven respondents to the online survey, including GPs from Health Boards across South Wales (excluding ABMUHB) and England; **iii) in-depth interviews with eleven GPs**, within ABMUHB who had trialled the eMR software, about their software experiences**; iv) industry views** were obtained from a Health Technology Consultancy with extensive experience of supporting GPs across the UK.

Key Findings

Clinical and Technical Report

Overall the twelve medical reports reviewed had a level of at least 95% accuracy when compared to the 'gold standard' model report. Thus the reports produced in the trial were found to be of high quality with focus on the relevant, specified conditions of interest and there were no cases of "wrong patient" data.

Online Survey

The respondents to the online survey were positive about the eMR software and their experience in using it. It was consistently noted that the eMR design, function and complimentary training were perceived as meaningful and appropriate, with the eMR software further described as having the potential to release valuable resources, such as GP time, and improve the timeliness of medical report returns.

GP Interviews

The GP interviews supported the overall findings from the survey, and were able to offer further insight from GPs as they elaborated on their current experiences and detailed their perceived impact of the eMR software. The interview themes are summarised below:

Training: The instructions and training material available for the pilot trial were positively remarked upon and all GPs felt they were readily able to complete the eMR reports with the support of written instructions or access to a video. This was further supported by the clinical and technical report which found that the electronic medical reports produced were accurate and meaningful.

User-ability: The ease of use generally of the eMR system, along with the unambiguous design, was consistently reported by the GPs as something that they felt would facilitate the application of eMR for medical report production.

Redaction process: The intelligible approach to redaction by the eMR software was complimented by all GPs, and noted as one of the software highlights by making the reporting task seamless; it was also noted that the redaction process instilled confidence in the users in regards to the software accuracy as well as being timesaving, with some GPs reporting that the nature of this function even made the report process enjoyable.

Report structure and submission: Overall GPs agreed that the eMR report produced was meaningfully structured and that it was easy to make any amendments required; it was further noted that being able to receive and submit the patient reports electronically would support GPs in safeguarding patient information, as well as being timesaving.

Patient consent: Immediate access to patient consent for release of the information was seen as helpful in regards to improving the speed of processing as well as being a reassuring feature for the GPs who would not proceed with a report until explicit consent was received.

General Data Protection Regulation (GDPR): Overall the eMR core features, such as the redaction process, were noted as making GPs feel more confident in meeting the new GDPR requirements.

Time savings: On the whole, the potential for release of substantial GP and administrator time was seen as one of the main drivers of change from current practice to software adoption.

Contextual matters: GPs were concerned that poor data quality on their behalf would reduce the functionality and application of the eMR software. Being able to set their own rates for compensation were seen as important when the topic was explored in the interviews, as GPs see the fees as a reflection of the value of their medical expertise as well as their time, and rely on this income as part of their funding stream. Being asked about their preferences and having input in to the software development was welcomed by all the GPs, who believed the succeeding co-production of a meaningful system would greatly support the integration and implementation of the eMR software.

Industry views

It was emphasised that GPs often feel challenged by the introduction of new technology, and may be slow to adopt and often unlikely to use software available without adequate support; furthermore GPs seek to preserve their time and it is important for any new system provider to gain the GPs confidence through quality, accuracy and dedicated support. It was highlighted that facilitating data quality reviews and the provision of targeted training, alongside software implantation would be particularly valuable to GPs, and MediData were commended for their early inclusion of stakeholders and generally collaborative approach to the eMR software development.

Recommendations

It was clear from the evaluation that MediData has already established good practice in their approach to the eMR software development through their early inclusion of end users; furthermore, a second phase is already planned that incorporates a full process evaluation alongside the wider implantation of the software across the UK. However, some areas of focus for the pre-planned onward processes are highlighted from the evaluation:

- As GPs are concerned about poor data quality related to historic coding practices by the surgeries, it will be important for MediData to build up confidence in the technical abilities of the eMR; this can be achieved through continued revision of the software to ensure that the clinical coding and redaction processes are precise prior to UK wide implementation;
- Maintaining the independence to regulate their fees is important to GPs and as such it should be emphasised in all communications by MediData that a guide fee only is offered through the eMR which GPs may wish to adopt once they realise the time savings;
- MediData should continue its current approach of explicitly including relevant stakeholders in the eMR software developments and extend its remit to include feedback from practice administrative staff and third party report requesters;
- The preferences for, and acceptance of, standardised eMR reports by non-NHS third party organisations should be emphasised in MediData communications with GPs to ensure any uncertainties around the wider application of the eMR software across report requesters are addressed.

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- ✓ All the participating General Practitioners for taking time out of their busy schedule to support the evaluation by testing the software as well as responding to the MediData survey and participating in the SCHE interviews about their experience of the eMR software. The information obtained has provided great insight into current medical report practice and for further eMR developments and due processes;
- ✓ Dr Michael Brooks for providing us with his findings from the clinical and technical review of the completed eMR reports;
- ✓ Our independent informant, an expert consultant providing technology support to GPs across health boards in Wales and across the UK, for providing insight into barriers and facilitators of health technology adoption and utilisation within primary care;
- ✓ MediData for funding the evaluation; for facilitating the MediData survey data, and for offering insight into the electronic medical report landscape and allowing us to be part of the eMR software development.

1. Background and Description of the Medical Review Landscape

Rising demand, changing patterns of work by General Practitioners and a fall in the proportion of funds allocated to general practice have led to the perception that UK primary care organisation are in crisis with unsustainable GP workloads (Dyan et al., 2014). Compared to their international counterparts, as well as to previous years; GPs in the UK report higher levels of stress and lower satisfaction with practising medicine; with results from the Commonwealth Fund surveys in 2012 and 2015 showing a decrease in positivity towards primary care practice organisation from 46% to 22% amongst UK GPs, with 59% of GPs in the UK describing their job as extremely or very stressful, higher than any other country surveyed. The limited time GPs get to spend with patients is a key area of dissatisfaction; 92% of UK GPs reported spending less than 15 minutes with patients per appointment, compared to an average of 27% across the other countries featured in the survey. Only 26% of UK GPs were satisfied with the amount of time they spend with patients, compared to an average of 59% across the other countries. The level of stress, and the high proportion of GPs who report they intend to leave practice in the next five years, is worrying. Effort is being put in to recruit new GPs, though the Commonwealth Fund survey indicates retention is likely to be as great a challenge as recruitment. Of the 29% of current GPs who say they intend to leave general practice within five years, a third are under 55 and not looking to retire. GPs in the UK, more than in any other country surveyed reported stress at work, with the limited amount of time they are able to spend with patients likely to be a key contributing factor. The general dissatisfaction and stress reported by GPs is supported by a brief report by the British Medical Association (2014) and a more in-depth review of the 'GP crisis' for the Nuffield organisation by Dyan et al., (2014). While public satisfaction with general practice remains high (Dyan et al., 2014), GP capacity must be freed up. The challenges that this shift poses are well articulated in the NHS Five Year Forward View (NHS England, 2014) along with proposals on how to achieve better health, better care and lower cost, the triple aim of healthcare (Berwick, Nolan & Whittington, 2008), through 'raising the game on health technology.' E.g., through fully interoperable electronic health records, so that patients' records are paperless (NHS England, 2014). The effective use of technology, the stimulation and adoption of innovation and the role of informatics is as such seen as one way to achieve the challenges described in the NHS Five Year Forward View with the hope that healthcare can follow the example of many non-healthcare industries, where the implementation of computer information technology has been a critical part of increasing accessibility of information, automate labour-intensive and inefficient processes, and minimise human error. The use of health information technology (HIT) has generally been seen as offering great promise towards improvement in efficiency, cost-effectiveness, quality and safety of medical care delivery and there is some evidence to support this (e.g., Hillestadt et al., 2005; Koppel et al., 2005; Gagnon et al., 2012; Steventon et al., 2012; Lapointe, Mignerat, & Vedel,, 2011; Li et al., 2013). Benefits for patients include having greater engagement with their own care (Abraham & Junglas, 2011). One positive finding from the Commonwealth Fund survey was that the UK's performance on using electronic medical records (EMRs) is comparatively strong with 98% of GPs routinely using an EMR in their daily practice in the UK compared to an average of 86% across the other 10 countries (Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Sweden, Switzerland and United States) featured in the survey. GPs' satisfaction with their EMR system and how stressful they found their job were also found to be positively correlated across all the countries featured in the survey; thus strong, functioning EMRs would seem to be integral to a strong primary care system (Martin, Davies, & Gershlick, 2016).

Adoption vs. Application of Technology

Although the UK can be considered a leader in EMR use across countries, the small UK sample size within the Commonwealth Fund survey means care is needed when making comparisons *within* the UK. It has been noted that there is clear variation in the use of EMRs across England, Scotland, Northern Ireland and Wales; for example, 91% of GPs in England routinely or occasionally use electronic ordering of laboratory tests within their practice, compared to only 31% of GPs in Wales (Martin, Davies, & Gershlick, 2016). As such the capacity of

health information technology (HIT), e.g., in improving health care outcomes (Blumenthal & Glaser 2007), can only be realized when HIT is accepted and used effectively by clinicians and supporting end users (Holden & Karsh, 2009). Difficulties have been noted in achieving clinical use of some kinds of clinical informatics applications Kaplan (2001) and it is imperative that HIT implementation is evaluated and that the features of successful implementation are identified. Further apprehension relating to system *adoption relative to system application* comes from numerous studies which have shown that even the most well-meaning, safety-oriented *clinicians do not use available HIT* (e.g., Zheng et al., 2005; Holden & Karsh, 2007; Lapointe & Rivard, 2006), *may disregard or work around some of the system functions* (e.g., Weingart et al., 2003; Kopperl et al., 2008; Vogelsmeier et al., 2008), or *may use only some of the available features* (e.g., Sequist et al., 2007; Simon et al., 2007). To this end changing end user behaviour and culture is seen as one of the biggest barriers to the successful implementation of HIT; furthermore, poorly designed and implemented systems that create opportunities for errors can result in frustrated healthcare professionals and make it increasingly difficult to change behaviours (Rudin, Bates & MacRae, 2016). For example, the UK National Programme for IT (NPfIT) was an ambitious programme that intended to drive digital capability across the NHS. The key aim was to enable the joining up of information systems and datasets to better inform the direct provision of care, and achieve both improved patient outcomes and the sustainable business models needed to achieve those outcomes. NPfIT did not achieve its aim due to multiple factors; however, a key reason noted as impacting the lack of success was that the program did not fully engage the end users, particularly clinicians, from the onset. The Wachter review has subsequently highlighted the critical need to engage end users, such as clinicians, of any system deployed, from the outset and propose a move away from NPfIT and into a new era where technology and informatics are considered a critical part of achieving the Five Year Forward View (Wachter, 2016). In their review,, '*Delivering the benefits of digital health care'* Imison et al. (2016) discuss how digital technologies can be utilised to transform health care in the UK; the review offers important insight from UK organisations on in their digital journey with lessons learnt regarding wider possibilities and benefits through successful implementation of information technology. The researchers constructively lay out seven lessons for success that encompass considerations for a transformation programme, with emphasis on investment in programmes of organisational change; product design which support clinician's tasks and processes (workflow) as well as their process of clinical decision-making (thought flow); investment in analytics to learn from data collected in clinical and nonclinical systems, pertaining to data quality; end user engagement to allow for system adaption; data sharing capabilities and robust data security, in form of strong information governance, which they believe will support end user and public acceptance (Imison et al., 2016). We have reproduced and tabulated the seven lessons in Appendix 8.1.

Non-NHS 3rd party Medical Reviews

In addition to their NHS work doctors are often asked for information about their patients by third parties (e.g., employers, government agencies, insurance companies, regulatory bodies, and many others). Any doctor may receive such requests, but in the UK they are most often requested from general practitioners as they hold the most comprehensive patient records. As such GPs appear obligated to complete a range of patient health risk assessments and 3rd party reports for medico-legal issues, Driver and Vehicle Licencing Authority checks, Department of Work and Pensions disability reviews and for patients taking out insurance to cover eventualities, such as not being able to work due to illness, or to compensate them for an event that impacts health. There are several types of reports that can be requested and, as the work is not part of, or paid for by the NHS, GPs are permitted to charge a private fee (generally at British Medical Association rates; BMA, 2013b) from the requester.

The report requests for which GPs can be remunerated privately typically fall into three categories (Hodson, 2017):

i. **Patient requests:** patients may ask for a medical report to demonstrate they are healthy enough to participate in a dangerous activity (Health and Safety Executive, 2015). For example, people who wish to go scuba diving or bungee jumping often have to present an approving medical report and the practice can charge for this.
ii. **Company requests:** after a patient makes an insurance claim, insurance companies often request a medical report to confirm that any health information provided by the patient is accurate. Companies are usually willing to pay for these reports as omissions may result in rejected claims (Toon, 2009).
iii. **Government requests:** government bodies such as the Driver and Vehicle Licensing Agency (DVLA) or Department for Work and Pensions (DWP) may request medical reports in relation to the payments made to a patient. Again, the practice is permitted to request a fee for these reports.

Source of Income or Resource Drain

Production of medical reports can be a valuable source of income as well as a drain on practice resources (Hodson, 2017). The interaction between GPs and 3rd party review requesters, such as insurance companies, has changed little over the years with requests for medical reports historically sent and answered by post. The process requires the GP to review the patients' medical records, select and/or redact the relevant information and create a report; all of which can be time consuming. As well as the time taken by GPs reviewing notes, medical reports come with a large administrative burden. After the initial request is received, the GP often requires further information. Entering into correspondence with companies and patients can be disruptive to administrative staff and delay the production process. This method is labour intensive for the GP, the completion of reports is time consuming and importantly, highly sensitive medical information is being transmitted by insecure means. The process has been reviewed by the British Medical Association (BMA) and the Association of British Insurers (ABI) who have agreed on a set of principles for the production of medical reports (BMA/ABI, 2010; also found in the BMA guidelines - BMA, 2013a; 2013b), e.g., medical reports should be produced within 20 working days of the request being received (BMA/ABI, 2010). If the procedure is inefficient, this increases the pressure on GPs and administrative staff to produce the report quickly which may result in poor service for patients. Furthermore, there are patient data confidentiality issues to be considered alongside the timeliness of this assessment as, for the most part, completing these reports is not part of the GPs NHS contract; thus, delays in report returns may not only lead to increased administrative costs but also a breach of the BMA/ABI (2010) guidelines indicating poor service.

Though there has been work done to understand the more general implementation of HIT within health care organisations there is no work we are aware of that specifically review EMR systems for medical reporting. However, some work has been completed that reviews current report practice in regards to the timeliness of medical report returns; e.g., in a recent study the efficiency of the production of medical reports were compared before and after the introduction of a policy within general practice to request payment in advance (Hodson, 2017). In accordance with the BMA/ABI recommendations, the study aimed to ensure reports were retuned in 20 working days with a target compliance level of 85%. The change in policy included ensuring the requesting body for patient requested reports (type i) or company requested reports (type ii) were informed that production of the report would not start until payment had been made. No policy change was deemed necessary in this study for reports requested by government bodies (type iii). Medical reports requested before the change in policy found that 74.7% of completed requests were returned within 20 working days. After the intervention, the proportion of competed requests rose to 87.3% returns within the 20 days. The results showed that not only did time taken decrease, but also that this was only the case in the two groups affected by the new policy; type iii government requests saw no impact. The study by Hodson (2017) highlights the potential for a change in processes and how this can impact on timely returns of medical reports, and though it is noted that the administrative part of the process is improved, the greatest benefit may arguably, in this case, be for the 3rd party requesters in receipt of

timely returns relative to support and time release for GPs. It is important to acknowledge the difference in this end result in the context of what GPs need for an improved process relative to the 3rd party recipients.

Electronic Medical Reports to release GP time

An online survey by MediData (2018) offers a conservative estimate that suggest GPs are asked to complete around 4-6 reports a week in smaller practices and up to 12 in larger GP surgeries. With already busy practices receiving increasing numbers of requests for patient health information from insurance companies, many GPs have been encouraged to adopt electronic systems which promise that their automated data extraction software with patient records can speed up the process for under-pressure GPs and insurance companies, as well as promising improved data protection safeguards. The Intelligent General Practice Reporting (iGPR) and Niche Health offer one such system, the iGPR was initially freely available to NHS GPs, however each GP surgery user is now charged £129 for support with General Data Protection Regulation (GDPR) compliance; iGPR promise to *'aid the drive for a paperless NHS and paperless insurance industry, [by enabling] GP practices to securely receive and respond to requests for medical evidence electronically'* (Niche Health, 2018). iGPR is available to the majority of GPs across the UK and their website reports that 60% of GP surgeries in the UK already have access to the software and that several major UK insurance companies have signed up to the system *'which 'removes the labour intensive, paper-heavy processing from practice staff and reduces the time it takes [GPs] to complete and review insurance reports'* (iGPR, 2018).

The development and provision of such software is growing and the Association of British Insurers (ABI) has drawn up a list of 10 principles setting out the standards expected of insurers when requesting and obtaining medical information electronically from GPs. The principles were produced after input from the Information Commissioner's Office (ICO) and the British Medical Association (BMA). The General Medical Council (GMC) has also endorsed the principles as consistent with their current guidance for doctors. Provided the principles are followed, the ABI notes that practices *'can be confident the process is as safe as the current system and, in some areas, is even more robust in ensuring GPs are better able to meet their obligations as a data controller under the Data Protection Act 1998'* (ABI, 2017). The principles assert that practices who receive a request from an insurance company should make sure it is submitted in accordance with either the Access to Medical Reports Act 1988 (Wales, Scotland and England) or the Access to Personal Files and Medical Reports Order 1991 (Northern Ireland). These two acts provide insurers with the correct legal route to obtain medical information. In the past, some insurers submitted less extensive subject access requests under the DPA but this was stopped in 2015 following a review by the ICO. Another key requirement is that electronic systems should provide the GP with the ability to automatically and manually redact, amend or add sensitive personal data to an electronic medical report before it is sent to an insurer to prevent the disclosure of third party identifiers, as well as any information that could cause serious physical or psychological harm if discovered. The electronic systems should also be able to ensure that only relevant health information is released. Another important issue pertains to consent, and it is noted that any electronic process should be able to provide an audit trail for both GPs and patients clearly showing *'what consent was granted, by whom, when and why'*. Systems should meet the relevant guidance set out by the ICO, GMC and meet NHS information governance and technology standards. Data encryption must also meet NHS standards. Insurers who introduce an electronic process for obtaining medical information will undertake a privacy impact assessment (or equivalent) and can confirm with the practice what process was used (a responsibility for data controllers under the new General Data Protection Regulations (GDPR) in 2018). The Government has also made a commitment that health record requests should normally be handled within 21 days, although the Data Protection Act 1998 would grant 40 days for GPs to comply (Department of Health, 2010). The new General Data Protection Regulation, in place from May 25th 2018, grants 30 days for compliance (GDPR, 2018).

In their statement about the 10 principles the ABI (2017) also noted the positive impact of utilising electronic systems, i.e., *'obtaining medical information electronically [ ] can benefit customers, GPs and insurers by:*

- *Making it easier to consistently protect patients' personal medical information.*
- *Speeding up the application process by ensuring that insurers get the right information to provide insurance cover, meaning that customers can benefit from valuable cover faster. In a recent sample, one insurer using electronic requests in 2016 has already seen almost half of electronic requests come back within 7 days, compared to an average of 22 days under the paper-based system.*
- *Reducing the time GPs spend on dealing with requests for medical information, giving them more time to deal with patients.*
- *Giving individuals greater certainty when claiming as the right information has been given to the insurer'.*

Overall the literature is sparse in relation to research that focuses on medical reporting and (electronic) systems that may facilitate this process. However, the more general health care information technology literature points to clear benefits which can be achieved through successful implementation of health care systems and software at varying levels of operational use. There is a positive view of technology as a strong support mechanism for health outcome achievements as well as lower costs, increase efficiency and productivity and provide a positive return on investments (Hillestadt et al., 2005; Gagnon et al., 2012; Lapointe, Mignerat, & Vedel,, 2011; Li et al., 2013). Social psychological theories explaining why humans behave in certain ways, such as the theory of planned behaviour (Ajzen 1985), postulate that attitudes, among other factors, affect behaviour. However, in the context of health technology it is clear that having a positive attitude does not emerge as a good predictor of adoption and application of such systems; thus continual end user engagement is noted as pivotal to technology implementation through supporting health care organisations in undertaking the process (and behaviour) changes necessary for true integration and outcomes realisation.

2. The MediData eMR Software Evaluation

In a response to the increasing demand on GPs to complete medical reports MediData are developing a software solution, eMR; the eMR is being designed and co-produced through explicit consultations with relevant stakeholders, such as GPs, medical record and patient data management systems (e.g. EMIS and Vision) and industry views from Health Technology Consultancies across the UK. The MediData eMR software allows an appropriate patient report to be compiled from the GPs electronic patient record in a very short time as the electronic request from MediData will only ask for the pertinent information via specific medically coding systems, Read and Snowmed CT, which is now the standard and universally used coding structure. The GP can then add relevant context and narrative, concentrating on the area where they can use their expertise and patient knowledge rather than spend time scanning patient data. The eMR process operates with explicit patient consent and meets all the current standards for medical reporting. eMR is being designed with the end users firmly in mind and specifically aims to reduce GP time spent on report completion as well as speed up the time of report returns, thus benefiting the GP as well as the patient and insurer. Additionally, it is anticipated that the use of the eMR software will reduce the risk of GPs providing inappropriate data by mistake.

2.1 Evaluation Aim

The aim of the evaluation was to describe the medical review landscape at present, how it might change with a new way of working with the eMR software, and to gather an account of GP perspectives on the value of time spent doing medical reviews and its alternative uses, the value of the income stream from medical reviews and attitudes to patient data and confidentiality.

2.2 MediData eMR Software Test

The eMR software was piloted across nineteen General Practices in South Wales (n=15) and England (n=4) between February and March 2018. The software trial included access to the eMR software via the GPs existing desktop systems. During the eMR test phase participating GPs were asked to complete six patient medical reports using 'dummy' data; instructions for the medical report request was provided along with training material detailing how to use the MediData eMR software, i.e., a written information sheet with step by step instructions and screenshots (Appendix 8.2) and an instructional video.
To test the system 'dummy data' in form of three fictitious patients were specifically created for the trial; each GP received six instructions, two for each of the 'patients', including a list of conditions of interest, where only medical information relevant to those conditions should appear in the final report. The GPs' task was to use the eMR platform to prepare a medical report for each instruction, containing only information relevant to the sought-after conditions in the instruction. The eMR platform should subsequently extract data from the 'patient's' master medical record held in the EMIS electronic medical record. The eMR platform should then perform an automated redaction based upon the SNOMED CT hierarchy of medical disorders. The automatically redacted report should then be available to the GP via an intuitive interface; the system allows the GP to redact further information, or append missing information.

Swansea Centre for Health Economics (SCHE) was commissioned by MediData to evaluate the eMR pilot. It was proposed that the evaluation by SCHE would take place in two phases; reported herein is Phase 1, an initial exploration of GPs experiences of the eMR software; this work is expected to lead into Phase 2 which will be an evaluation of the software across a wider stakeholder group once implemented across the UK.

3. Method

The evaluation completed by SCHE comprised of GP stakeholder interviews from practices participating in the MediData eMR software trial within the ABMUHB; the methods and procedure described herein pertain to the SCHE evaluation only.

3.1 Design

A descriptive evaluation of GP viewpoints on the MediData eMR software was conducted through a qualitative approach which included stakeholder interviews of GPs from practices participating in the eMR software trial conducted by MediData. The GP perspectives and experiences were investigated via individual (one-to-one) semi-structured interviews using an interview guide developed collaboratively by the evaluation team. Semi-structured interviews were identified as the most appropriate methodological approach as this would facilitate focus on key areas while allowing participants to expand and comment on further issues which were important to them. A topic guide (Appendix 8.3) was developed based on the key issues identified by the team supported by the literature review, key informants and anecdotally from discussions with the MediData development team. The topic guide was informed by emerging themes from the stakeholder interviews as the interviews progressed, thus allowing the interviewer to follow up relevant topics introduced by interviewees and open new lines of inquiry when appropriate.

3.2 Sample

A list of General Practitioners (GPs) who had participated in the trial of the MediData eMR software was provided by MediData. GPs from the ABMUHB area were identified for interviews as per the service evaluation process agreement with the ABMUHB Research and Development team (R&D). The key characteristics are not presented specifically for each interviewee as this could breach anonymity; the sample included twelve male and female GPs from 10 surgeries across 7 GP clusters (Afan, Bay Health, Bridgend East Network, City Health,

Llwchwr, Neath & Penderi) within ABMUHB. The GP surgeries included varied in size from 2-12 GPs with patient list sizes ranging from just under 4000 patients to just over 18000 patients. The surgeries were equally supported by EMIS Web or InPS Vision clinical software systems (5 GPs with EMIS and 5 with Vision). The GPs interviewed included senior partners as well as more newly qualified practitioners. The GPs all reported experience of working across different practices and were able to reflect on practice in medical report processes from different surgeries when asked about such report request experiences.

3.3 Recruitment

All GPs identified and recruited by MediData to pilot the eMR software were informed of the SCHE evaluation and were given information by MediData about the opportunity to participate in an interview to discuss the context, training process, and experience of using the eMR software. All GPs were remunerated for their involvement in the software pilot and for taking part in the subsequent interviews.

Once information was obtained from the MediData team about GP interest to participate in the interviews GPs were sent an email of invitation together with an information sheet and consent form (Appendix 8.4 and 8.5). This was, if necessary, followed up with a reminder telephone call 1 week after the initial contact was made. Stakeholders who were willing to be interviewed could confirm this by replying to the email or verbally over the telephone. Interview arrangements were then made via email or telephone.

3.4 Data collection

Interviews took place across February and March 2018 and were carried out at the GP's convenience. In all cases this was via a telephone call (to home or work as preferred. The interview began with a reminder of the evaluation aims and the interview procedure. Consent was confirmed verbally (in addition to written consent where already received). All participants consented to the interviews being recorded and a digital recorder coupled to the telephone line, was used to record the interview. In addition the interviewer made notes to supplement the recording. The topic guide was used to ensure the key areas were covered but the order in which these topics were discussed varied from interview to interview as directed by the interviewee. Open questions were used to explore and closed questions were used for confirmation and to probe further. At the end of each interview, the interviewee was asked if they had anything further to add to the topic. They were then thanked and the interview ended. A thank you email was sent to all participants after the interviews, reminding the stakeholders of the research aims, notifying due process and providing them with contact information for the principal researcher as well as the interviewer to allow for any queries.

3.5 Procedure

The interviews were transcribed, reviewed and coded thematically using constant comparison to review the themes which arose. Where appropriate, sections of text have been used to illustrate the themes.

3.6 Ethics

Using the NHS Research algorithm (http://www.hra-decisiontools.org.uk/research/) the work was classified as NOT research; a summary of the work was submitted to the Joint Study Review Committee (JSRC) Sub-Committee at ABMUHB R&D and the committee agreed the project is classed as a non-research / service evaluation and not in requirement of NHS REC or R&D applications. The conformation was communicated through email from the Assistant Manager of ABMUHB Research & Development on the 10th October 2017.

3.7 Data Governance

All electronic data (including anonymised electronic copies of transcripts) was stored within a server on a password protected S drive folder in the College of Human and Health Sciences, Swansea University. Any paper copies of participant transcripts are stored separately to identifiable information (e.g. consent forms) and will be held in locked filing cabinets within the SCHE office, which is protected by a coded lock system at the College of Human and Health Sciences, Swansea University. Original audio files were destroyed once transcripts were

checked for meaning or missing words. The qualitative researcher field notes are stored and used according to standard confidentiality protocols. All audio files were transferred from the portable recorder as soon as possible after completion of the interview. Audio files were encrypted and stored on a password protected university computer. When the study is complete all other data will be destroyed by the principle investigator. The maximum time the transcribed data will be kept is 5 years.

4. Results

Descriptive data was collated for the evaluation, though no statistical analysis was performed by the SCHE evaluation team of the eMR software data collected; a clinical and technical report of the returned eMR medical reports, to demonstrate and validate the eMR functionality, was independently produced by Dr Michael Brooks, a James Paget University Hospitals NHS Foundation Trust & Medical Technology Consultant. MediData conducted a brief electronic survey of GPs trialling the eMR software across other South Wales health boards not including ABMUHB; descriptive data analysis of the survey responses was completed by SCHE. The opportunity arose to include an additional interview with an independent informant with expertise in health technology; the interview was completed by SCHE with the aim to offer insight into current barriers and facilitators of health technology adoption and utilisation within primary care in Wales.

A summary of the findings from the clinical and technical report along with the MediData survey is reported to complement the GP interviews and are as such detailed separately.

4.1 Clinical and Technical Review of the MediData eMR Reports

A qualitative analysis of 12 randomly selected medical reports from the pilot sample was conducted by an independent assessor, Dr Michael Brooks. The analysis compared each completed report with a 'gold standard' model report prepared by the assessor.

It was found that overall the eMR platform produced condensed medical reports with approximately 95% accuracy when compared to model reports. The reports produced were of high quality and focused on conditions of interest; there were no cases of "wrong patient" data (Brooks, 2018). The focus of the analysis and findings are reported in Table 1 below.

As can be seen from Table 1 the largest category of error in the eMR generated reports was incorrect inclusion of medications. The assessor notes that the source EMIS data had medications which were deliberately not linked to conditions in some cases to reflect real-world data quality; other reasons for these errors are noted as the automated redaction of medications was not strict enough; and that GPs may have become 'used to' other areas of the report being accurately automatically redacted and as such did not examine this section of the report in enough detail (Brooks, 2018).

There were four omitted pieces of data; one of the omissions was made manually where a GP had redacted a consultation with the presenting problem of *"Depressive disorder NEC",* where the consultation reveals that the likely diagnosis is *"Bereavement".* This is a normal (physiological) response to an adverse life event so could be argued not to constitute a "*Mental disorder",* which was the category of diagnoses sought in the relevant instruction (Brooks, 2018).

The review revealed a limitation with the automatic redaction routine around alcohol consumption. Where alcohol consumption was recorded as "*Alcohol intake within recommended sensible limit"* within EMIS, it was not detected by the software algorithm; this will be addressed in the next release of eMR (Brooks, 2018).

Table 1. Clinical and Technical report analysis and findings.

Focus	Results
Wrong patient errors: - Where information pertaining to a different patient appears on a report	**No wrong patient errors**
User Interface - The intuitiveness and clarity of the reports	**Excellent clarity and readability across all reports**
Erroneous inclusions: - The presence of medical information which did not relate to the conditions of interest	**12 erroneous inclusions affecting 9 records**; of which ***9 medications were not relevant; including*** - Antibiotic eye drops - Hormonal therapy patch - Immunosuppressant tablets - Bronchodilator / steroid inhaler - Proton pump inhibitor - Antidepressant - Influenza vaccine ***3 consultations which were not relevant***; of which - 2 were apparently blank consultations, which corresponded to an automatic log entry by EMIS for an outbound referral to physiotherapy - 1 was for an influenza vaccine appointment
Omissions: - Medical information known to be in the patient's EMIS medical record, but did not appear in the final eMR report	**4 true omissions**; of which - 2 were for alcohol history on the same patient (automatically redacted) - 1 attachment (manually redacted) - 1 consultation (manually redacted)

4.2 Media2Data Survey

The MediData electronic survey (MediData, 2018b) was sent out to 9 GP surgeries in South Wales and England with responses received from 3 surgeries in South Wales and 4 from England. Out of the respondents 57% reported using EMIS, 29% used System One and 14% used Vision. The survey was anonymous thus we do not have access to the corresponding practice demographics.

Current Process for Non-NHS Medical Report Requests

Forty-three percent of GPs reported spending 1-2 hours per week on non-NHS 3rd party medical report requests (e.g. DVLA, DWP, Insurers and Solicitors), whereas 29% of respondents used 2-3 hours; 14% reported spending more than 3 hours a week and another 14% reported spending less than 1 hour on such reports. Seventy-one percent of the GPs reported completing between 1-3 reports per week with 29% reporting completing more than 5. All the GPs (100%) in the sample reported that they do not use any software solutions to support the completion of reports; with only 14% of the GPs reportedly having attempted to use any software for this support, namely iGPR, though it was detailed that as there were issues with payments the software had not been further explored.

All GPs reported time as one of the key issues of concern or difficulties with processing requests for medical reports; 57% noted worries about confidentiality as another key concern; 57% had concerns about the quality of reporting; and 71% were concerned about adhering with the new GDPR regulations.

eMR System Experience

All respondents found the training provided with the eMR software to be very helpful (71%) or helpful (29%) and the provider support as very good (71%) or average (29%). The majority completed the reports in 5 minutes (57%) whereas the others competed in 10-15 minutes (43%). The software itself was found to be very easy (57%) or easy (43%) to use. The features that were particularly liked were the report structure (86%); the final report (71%); the user interface (57%); the navigation (57%); the readability (57%); the easy redaction process (43%); and the accuracy of data (29%)†. The majority reported that they would be very likely to use the eMR software (86%)) and to recommend it to other GPs (71%).

eMR Potential for Impact

The main bearing on GPs from dealing with non-NHS 3rd party medical report requests were seen to be that GPs had to work extra hours outside of surgery hours (86%); that there was less time on administration and regulatory tasks (57%); and that there was less time available for patients (43%). All respondents thought the eMR software would have a positive impact on their workload and save them time in completing medical reports; through faster reporting process (86%) and faster overall turn-around times (57%). The majority thought the system could save them at least 1 hour per week (57%); 14% believed it would save around 2 hours per week and 29% of respondents noted it would likely save 30 minutes a week. All respondents also noted the quality of the report was improved with the eMR software (100%). Other benefits of using eMR were seen to be that it saves surgery administration time (86%); and having the option to complete reports outside of the surgery (57%). The majority were certain the eMR system had the potential to allow for same day reporting (57%) whereas others thought this may be a possibility (43%). One respondent commented that the eMR software offered *'Easy functionality, excellent user interface, redaction accurate and need to spend less time validating the redaction. All sensitive data automatically removed'.*

Recommendations for Further Software Development

The respondents made comments to allow for further system development, such as: inclusion of details of dates the records are held from; inclusion of system review functionality; being able to see the 'information requested' box as you scroll down the report; explicitly indicate in eMR that the patient has given consent for the report to be completed; clarify what is meant by "references to third parties" with respect to reports (with examples) in the instructions at the top of the screen; not having the document auto-scroll to the top of the report every time an 'update' button is clicked in one of the sections; not have an 'update' button for each section of the report, but rather a universal 'update' button which saves all recent changes work better; to make it available for producing generic redacted supporting letter/reports to support ESA/PIP/ Blue badge requests/Housing etc.

Fee Acceptability

The majority (71%) responded that they would accept a fee of £60 for reports completed through the eMR software.

† As the respondents used 'dummy' data for the eMR software evaluation it may have been difficult to truly assess accuracy in this test-format; furthermore, the in-depth interviews revealed that GPs have concerns about historical coding and data accuracy within their own systems and the implications that this may have, independently of any software use, when extracting information from patient records.

4.3 Stakeholder Interviews

4.3.1 GP interviews

The interview topics focused around two areas, the GPs current medical reporting process and their experience and perceptions for use of the eMR software. During discussion of the current process for non-NHS medical report requests the main themes of were about dedicated time to complete reports; the frequency of report completion; the actual time spent on reports; the current reporting process; the increased complexity of task due to variation in report requests; timeliness of report returns; tees and payment; patient confidentiality; and current software utilisation. In regards to their experience of the eMR software the main topics of discussion centred around MediData eMR interface and usability; the case for real world vs. 'dummy' patient reports; data quality and paper records; eMR training perception; the potential impact of eMR software use on GP resources; delegating the report tasks; and fixed fees for eMR generated reports. These interview themes are elaborated upon below with quotes from the GPs.

Current Process for Non-NHS Medical Report Requests

Dedicated time to complete reports

Throughout the interviews it was apparent that there is no time allocated in the work day to complete the non-NHS 3rd party medical report requests; all GPs reported that it is common practice for across GPs to, complete such reports during their 'free' time, such as lunch breaks or 'after hours':

> *'I normally do it lunchtime, or I'll stay after work and do them.' GP2*
>
> *So we [complete the reports] during our lunchtime, or any time that we can make in-between patients…there's no dedicated time to do these reports. The time is the main concern there.' GP7*
>
> *'We don't have any time put aside for it, so [the reports are completed] after work, you know, in the evening or lunchtime kind of thing.' GP4*
>
> *'We just … it just means that it adds to your workload, so all the other work would be a bit more rushed really, I wouldn't say you, you know you wouldn't not do your clinical work or compromise your clinical work because of it. It just is another thing that adds on top of it, so therefore it may make your, you know, eleven hours long day a twelve hours long day kind of thing. That obviously you know just works towards kind of fatigue and exhaustion and burnout really.' GP5*
>
> *'[The reports] are not part of the NHS work, so for us, the NHS work is the priority, as GPs. But obviously for the patient, they have their own you know insurance policies, they have travel plans, so we would try, we should try and do these reports as soon as possible in order for the third parties to make the relevant decisions. So … with that in mind, all of our GPs and administrative staff, we try and find some extra time, usually after surgeries, lunchtime…… and it's after our clinical commitments, then we go on to do the non-NHS work, like the reports.' GP10*

Frequency of report completion

Overall GPs reported completing reports on and ad hoc basis as and when an opportunity would arise where 'free' time could be utilised for this task. Some GPs noted there may be an attempt to return requests on a weekly basis, whereas one GP noted their surgery had a more structured approach to report returns, whereby an administrator collates report requests and prepares these for completion once every fortnight; the responsibility for such report completion is shared across the practice GPs on a rotating schedule. Another GP noted that

reports are never completed ad hoc or on the 'same day', but rather collated for a time when they can bring in a locum to cover an afternoon session, so one of the GPs can take 'time off' to complete the reports. However, there was no regularity how often this 'session' would be organised.

> *'It goes in sort of a cycle … cycle for us, because one of the GPs get this every week, sort of the same. So I would say around … four or five a week'. GP8*

> *'So it depends upon, you know, we pool all the reports together actually, one of the GPs will do it once every fortnight actually…so we have to schedule it accordingly, sometimes we may need to get a locum to cover that session.' GP9*

Actual time spent on reports

The time spent on completing reports varied between GPs, it was noted that some GPs who work part-time would have less requests to complete; overall the GPs reported spending between 5-30% of their time on completing report requests. The request rate also ranged from 4-8 per week (per individual GP, not for the overall practice). The increased demand form non-NHS 3rd party requesters were also noted:

> *'We're asked for more and more reports nowadays actually.' GP9*

Reporting process

Most GPs reported completing the requests manually, by handwriting reports, and noted this is the practice they know of colleagues as well. The process was also noted to include lengthy photocopying as well as document scanning in some cases.

> *'As far as I am aware, like the practices I have worked in, it's always been manually done.' GP1*

> *'..so for an example, if it's a request from, say for instance an insurer, like a claim or something a patient is making, then the clerical staff will acknowledge that and usually redact sensitive information. But they do it manually, they get a printout of all the notes and they do it manually, and then, then we check them, cross-check them, and then we release the record then.' GP1*

The completion of a report was noted by all GPs to include at least one GP and practice administrator and was often reported to include several steps for completion of the process, e.g., with information being provided then checked with subsequent information being required to be obtained:

> *'about two people get involved actually, there is a clerical staff…who actually gets the initial request and she gets all the initial reports for us… she gives it to the GP … and one of us sit down and then look into it to see what we can redact….if we feel it's not the right information that she has brought together, we need look back into the notes…sometimes it takes about an hour for some reports to be completed. Because we need to say, can you include these things separately, and then she'll do the new report and we have to finalise it then, after that' GP9*

> *'you know, this is the clerical time as well. And then for us to go over everything, sometimes it'll be like two or three files, paper files, you know, the information that we need to go through before releasing it' GP2*

> *'The staff will then go and find the patient notes, and then put it down to us, or share it to the partners and then it comes into my desk, and then I will go into the patient records, and write and fill in the form, the questions that are asked….once I complete it, then the girls take it away from me, raise an invoice,*

wait for the invoice to be paid and then release the records. So each record that comes through, into the practice, I would say at least a good ninety minutes gets spent on each …' GP4

Increased complexity of task due to variation in report requests

The GPs all noted that it was difficult to 'plan' time for reports due to the variation in forms and types of requests by the different parties asking for information.

'The main problems, obviously the different companies, I mean different people have got different requests, yeah, and they've got different forms as well, so we've got to make sure we go through all those forms, fill in all those details and go through the patient's records and then sometime I feel like you know it's annoying because we have to handwrite it for ESA clients, so constantly get the form, so we have to handwrite those forms as well. Again, that's something annoying. Sometimes you've got so much of the medical history there and you can't fill in all in one form and sometimes I say to them print it out and summarise some patients' details, just redacting certain things. We have to do all those kind of things ourselves, it's really time consuming' GP7

'Some of them are just one page, which might take ten minutes, but there are some reports which take forty five minutes, also … I think the maximum it has taken for me to do one particular report, as I can remember, it would be about an hour, that's a very extensive report asking about various things for, about a patient.' GP10

Timeliness of report returns

Completion of reports was not seen as a priority by any of the GPs, and as such it appears completing requests are often delayed beyond the time frame given by the 3rd party. Overall it was reported that most requests would not be returned within a month. GPs felt quite strongly that their priority was the clinical work in regards to patient appointments. The urgency of some reports was recognised and GPs would prioritise these to some extent, though not above their clinical work. And though the relevance of the reports was acknowledged there was real frustration about having to miss out on patient time to complete reports; even when contemplating the usefulness of an eMR system to support the work it was clear that GPs would prefer to use their 'free' time such as lunch to complete the requests over any patient time.

'As a doctor, I think priority is clinical work first, but then after that it's the, you know, obviously producing medical reports' GP2

'I regularly miss the deadline because of the work, the clinical workload' GP11

'Right, the request is received by the practice, there's a dedicated person who handles these requests. She would then put it in the respective doctor's tray to be actioned. Usually we would be expected to send it back within twenty one days, but practically that usually doesn't happen because of the clinical workload, this might take … roughly I would say any request takes up to a month for us to be able to do the report and then send it back to the concerned parties' GP10

'I haven't gone beyond three weeks, usually I don't, but during busy periods it has been the case, like say in the winter months, you know sometimes a patient, you know, the report has to wait for like three, four weeks before it's being completed. So I won't say that I never done anything beyond three weeks, I have in certain circumstances…' GP2

'You know one session and one afternoon where I could have seen eighteen other patients. You know, so, but it's every week, and if you think of that between twelve of us here, so twelve x eighteen patients every week would not be seen …' GP4

'There are third party requests for urgent information, they will come to as urgent on it, and then they will be acted upon very quickly. But if it is routine, we usually do take twenty one days' GP4

'Probably not [returned within 21 days] in terms of the… from the date on the letter. But I think part of that is, like I said, because we usually send it back and get the fee first, so obviously that takes a bit of extra time, but …' GP6

'To be honest, it depends how busy we are as well, you know, if it's really busy doing it, you know, it's not, it's not our first priority, so … But I think in terms of you know, if it's going to be a lot quicker to do, then this [the eMR software] is certainly something that would, you know, make it easier to do in your lunch break or whatever, particularly as you're not, you're not writing, so you could just, you can do it you know just with a computer and using the mouse basically' GP6

Fees and Payment

Another reason the reports are delayed may be related to the request for payment prior to report return. All GPs noted that the reports are not completed / released until the fees have been paid by the 3rd party requesting the information.

'Once I complete it, then the girls take it away from me, raise an invoice, wait for the invoice to be paid and then release the records' GP4

'When the report comes through, the secretary goes through it and checks how much, the amount of information they need, and they will generate an invoice first and then they'll send it to the company or the solicitors who asked for the information. They pay their fees in advance, and then once the payment has received, then we'll do the report.' GP11

The GPs felt different types of work need to be costed individually. Some GPs have a set fee rate that they impose for any reports based on the amount of information required, whereas others allow the 3rd party to dictate the fee offered. Some of the GPs were not aware of their practice charges as this part of the process was dealt with by administrators.

Well that's determined by the insurance company. Now most of the reports would say how much we would have, so we just invoice for the amount that they mention and by the, the usual guidance, the BMA guidance. So we sort of invoice them for the amount that they have mentioned. So in reports could vary from let's say 25, £20 to … anything up to £120, £130, depending on the length of the report and the extensiveness of the report as well.' GP10

Most GPs also reported that the fees go to the practice whereas one GP reported that within their practice the GP completing the reports receive the remuneration personally.

'to remunerate for this, the payment which comes through, goes to the individual doctors, because they are doing it in their own time and not in their work time basically.' GP10

Patient confidentiality

Patient confidentiality was a considered part of the medical reports for all GPs, though emphasised by some in regards to being of particular concern when immediate access to the patients consent is absent.

> *'The confidentiality would, again that's the thing, sometimes then you get the reports without a patient's consent request, so we'll have to get back to the requesting people, asking them to get the consent form. Once the consent form is released, then, then … then it's OK, then the patient has given us authority. But there are concerns now with this because if for argument's sake, the patient has a whiplash injury …… and the solicitors are asking for a report of the patient's injury, right? So they might have only seen us once for that, but their entire medical record gets released, so there could be loads of other sensitive information, which we will try to cover that as much as possible, so that we don't release any confidential data, but there is always that danger….so that, so that is a problem.' GP4*

> *'In terms of confidentiality, we make sure that the person who we are writing the report about has given us informed written consent, without that we will not release any reports. And the doctor then who is in charge of producing … well who signs the report would check for relevance of the material, then for, we'll also check manually for any third party information which might be in the record. And then we try not to divulge any sensitive information, so we try and take things like that out of the report. And of course some reports, the pers … the patient themselves would have indicated that they want to look at the report before it is sent off. So they are given a chance, I think they're given up to, a period of one week or ten days, for them to come and have a look at the report before it is sent off, so that they're happy with the content of it.' GP10*

Current software utilisation

Most GPs noted being aware that there is currently software (iGPR) they can access to support them with medical reports. However, only three reported having 'tried' the software and only one of these had used it for reports. One GP noted that the software available offer low and fixed fees for report completion which they perceived as a reason not to use the system. The system was also noted to not be 'smooth' and as such GPs reported that this meant they would print the forms to do them manually anyway.

> *'It's better than nothing, but it's not particularly kind of user friendly and it's quite clumpy and repetitive really. So when it all comes to be, when it loads up the iGPR, there's a lot of information perhaps that you don't need on there, that's on there, is on there twice kind of thing, and comes up in a few different places, so there's not … particularly smooth I wouldn't say, so it needs quite a lot of tweaking' '[would rate the iGPR software] five out of ten' GP5*

> *'with the iGPR we need to look at a paper report as well, along with what is there on the system.' GP8*

> *'there was quite a few colours on there, on the report, redacted report, and it was so confusing, the competitors ones [iGPR], you didn't know which colour meant what. Say for argument's sake, it was giving me red, green and blue colours. So red means they were going to redact it, but it was still highlighted. It was really confusing, the other one, the, I mean the competitor one, whereas this one was much easier on the eye, yeah.' GP4*

MediData eMR GP experience

Overall the eMR software was well received and all GPs reported on positive features and application of this as a timesaving and quality assurance opportunity.

'it seems to be the developers of the software knew exactly what the GP, what it wants, so they have done their research very well. And with the GDPR coming in, I think there is right time that they have launched this product, and I can't see any problems why it shouldn't fly off the shelf really' GP4

Interface

The system design was positively reported to be 'simple'; the redaction feature of the software was highlighted as 'really helpful'. It was considered a useful feature to have 'everything' within the same system meaning there was no need to 'switch' between screens.

'The user interface was very clear, in the sense it was not very crowded, it was, most of our clinical systems, when you look at the screens, it's very, very crowded with lots of information at various parts of the screens, whereas this was, if this, you know, you can scroll up and down, it just has what you needed for a report and nothing else on the screen. So the interface was very easy and simple to follow.' GP10

'it was good to have like a print preview of the actual document before you obviously formalise it, so that it does save you sort of printing it out to read over it and then you can see it, you can make sure you haven't forgotten to take anything out' GP1

'Having the letters within it was really good as well, so you don't have to go back into a different system to bring up the letters, it was through that, so that was really good. Because I tend to use Vision in the practice that I work in, and obviously if you're going back and forth from different systems, it can be a bit clunky, if that makes sense. But it was nice that it was within the programme.' GP1

'The user interface was very good, you know, simple colours, not distracting colours … you know it was easy on the eye and it gave the user the opportunity to interact with it very well and with things. It was easy to understand the symbols, there was … yeah, it was all very good actually.' It was very easy to navigate; it was all on one page anyway, yeah. There was no click to the next page or everything; it was all on one page'. GP4

'the tick boxes [were very useful], you know, it was much more easier actually, the green ticks actually which we can just kind of you know rather than sort of blacking it out, we could just tick it and tick it/un-tick it and it just takes it out, doesn't it, automatically?' GP9

[The auto-redacted functionality in protecting patient confidentiality] is very useful; obviously we don't want to be disclosing sensitive information, which is not needed. So you know if it actually access the first you know thing that stops things getting into the initial report, then it's easier. So we don't need to be looking into it too hard! GP2

'you could hover over the patient information to know exactly what medical conditions that they're relating to in your requests, and that I thought was very handy, because it saves you scrolling up and down all the time as well' GP1

'… it makes it a little enjoyable I would say, making, using the, doing these reports, because what happens now is we have to hand-write, look at all the heaps and heaps of medical information, pick out the information and hand-write the reports, which is not a pleasant experience. Whereas this one, it's almost like a game, everything's pull out the consultations and you've got … sit in front of a screen, you could click or unclick, so, just using the mouse, and maybe type a few things on free data, and off it goes then, you know. So it's more user-friendly and more enjoyable, less taxing on the person who's doing the report. So of course when we are left with a number of reports at the end of a week, it might not seem like a big task for us, so we'll be able to get through it much quicker, with ease.' GP10

Usability

Overall usability was found to be sufficiently 'user friendly which was supported by the limited training required and the fact that no extra support by the MediData team was required'; the redaction feature was emphasised for its ease of use and clarity. Some GPs further highlighted that they found it easy to rectify any mistakes made:

> *'You could easily change the things you wanted to' GP3*

> *'the headings were quite useful, you know for example, ischaemic heart disease or a neurological disease, if you click on that, then it takes you to the consultation and that was helpful' the vital signs data, you know blood pressure, height and weight, you know that, that was quite helpful.' GP11*

> *'in fact [the auto redaction] made life a lot easier, so … and if you, if you want to take a problem off, you could click the problem, section, then it takes all the consul … you know all the consultations away. So that was probably the best of the software'. GP11*

> *'I think it has definitely simplified [the report process], because it's very user-friendly, it's all in one screen. It takes you out of the usual, of our usual clinical systems, so you don't have to scroll through all the information. It pulls out the relevant information in different boxes, so that it's all separated out easy for us to just click on, click things. So it is definitely very user-friendly and makes the process much quicker.' GP10*

> *'It was very easy to integrate it, we opened up, I was able to open it up on one manager's servers, there were no firewall issues, and everything was very smooth' GP4*

> *'it was easy to access and just what information needed, you just had to go through it, tick and un-tick, it took very little time' GP3*

> *'the feature to redact information by just clicking a button is very useful, it's easy to make and then it makes us look at each line to actually make sure that the right information is there. Then at the information about the patient, the left hand column and you click it, the summary of the patient and the points that are being asked for, that just pops up at any point in the screen, so that's very useful …just to remind ourselves what we are looking for. And of course then there is this feature of loading the full report of the patient and having it in a separate window for us to reference, that again is very useful because if you are not sure whether the software has pulled out all the relevant details, then you can look at the full report to make sure all the relevant details are there, and if not, you can add things as free text.' GP10*

Some GPs compared the MediData eMR usability to that of systems with which they had previous experience.

> *Well I think this is easier to use [than current system iGPR]. Initially … it just seemed much more kind of dynamic, and obviously it had everything up on the screen as well, whereas when, the old one they used brings everything up in kind of Word format, whereas the interface of this one was easier to add things, you know, take things away, which obviously we did. The system we use now is quite long-winded, whereas this, everything's in the same place, you can quite easily see it and do similar things, you don't need to be in there. I thought you could clearly see if any confidentiality was going to be breached, and you could remove that if necessary. I think there's probably less chance of it happening on this system than the old system.' GP5*

Real world vs. 'dummy' patient

A few of the GPs commented on the ease of the pilot instructions not being an accurate reflection of 'real world' contexts; they all appreciated the nature of the task and being simplified for a test phase, however they felt it was important to be aware of the 'real world' issues they faced.

> *'I thought it was quite easy to use and quite intuitive really. I didn't find that there was kind of much … a lot of the reports that we get, obviously when the … in the dummy ones, there was quite specific … for specific things, whereas a lot of the reports you get bring up everything, and they don't ask for so much specific conditions. So that was, I thought that was very good, and that was kind of, that worked well. And it's much clearer to see to everything, like the kind of patient profiles and everything. So I wouldn't say there was anything [wrong], I thought it, I thought it worked well I have to say.' GP5*

> *'So obviously I looked thoroughly through these reports, but I always find it's very different when you're doing it for a real person. And a real patient. So when I did these test ones, we only generally had a, what we would call a summary from EMIS, we didn't have the full EMIS notes. Obviously when we do it, when we look through all of the EMIS notes, which is obviously much more comprehensive than just the kind of the, the summary of the medical report we got from here. And the other thing is, we also, we will also need to look through all the paper notes. Which we didn't have to do for this one. Because we didn't have any paper notes. So sometimes, if someone's in their kind of sixties, then they've got quite a good stack of paper notes, and really when you're doing the report thoroughly, you have to make sure, and look through those papers notes and letters to make sure there's nothing that's been missed.' GP5*

> *'In the six reports that I've done, looking at the full report, it, the … the software was able to pull out all the information that was necessary. So I didn't actually notice any discrepancies. However, one thing I noticed was the full reports was only for certain short duration, the last three, two or three years of the medical records. I wonder how it's going to work for a person who's been with the practice for let's say ten years or twenty years, and we might have electronic data for all the duration. If the software is able to pull out all the information from all the previous … consultations as well, then I suppose yes, it's a great software." GP10*

Data quality and paper records

Though overall positive about the eMR software some there was an uncertainty about the full functionality of the software that they were unable to grasp due to the limited 'testing'. This uncertainty was rooted in historical concerns about data quality and access to paper records hindering them from fully utilising the software. One issue was also whether the software was able to 'read' the free text that is reported during consultations. GPs often record notes in from a consultation in form of plain text rather than coding them, as such the GP would need to know that the software can confidently pick up on plain text information. GPs also reported spending a lot of the time on medical reports checking the plain text information and feel this is not something administrators can do. However, if they had confidence in the software being able to pick this up it would really free them up to delegate some of this work to administrators and only have to check over the work.

Most GPs report having very low confidence in the coding (previously) completed by others in their patient files, most cite this as a historical problem, though they note that it is still a current concern. This mean they feel they have to double check the patient files even after they have been checked by software as they believe the coding may be wrong or that other terms may be included in the free text rather than coded (as noted above).

> *'I feel it's really depending on coding and how the information has been entered into the, into the computer' GP2*

'The coding is an issue, I suppose, you know if … that has to be done properly to be picked up by the software I believe' GP2

'If it hasn't been coded properly, so it's not on EMIS, so it doesn't come up on this, but actually if you look through their paper notes and they've got letters about a previous mental health problem, it, you could, you would obviously be liable for that, because you have to say, look through all of their medical notes.' GP5

'Yes, so ideally someone should have gone through the paper notes and taken out the main diagnoses and coded it. That's what should have happened, but you, it's not unusual that you find something in the paper notes that hasn't been properly coded …' GP5

'It's always difficult because everyone's notes and what's in them is always different. I think part of the problem is it depends a lot on quality of the notes, rather than necessarily the software, if you see what I mean…because obviously if the notes are very organised, in terms of the problems and the … the history taking, the consultations, it's relatively straightforward to bring it in, but a lot of the time the coding is not correct in the notes and things, and that's what makes it hard, is trying to pick out what's been coded correctly or not' GP6

'I don't see that there's any problem with it pulling across the data, it's more from our point of view whether it's coded properly, that's the problem. So I think in terms of the actual software, there's no issue with it pulling across the information.' GP6

'Some GPs may not be coding the problems using the right codes, for example if it's ischaemic heart disease, some GPs don't, I mean they don't code it as an ischaemic heart disease, though they are talking about that, they put, they … and if they don't put the problem, or sometimes they put have a chat with the patient, and then they talk about the ischaemic heart disease type of thing. And that means that sort of information, I'm not sure how to, how to, how MediData can, can extract …' GP11

Pilot eMR Training perception

The training provided for the eMR pilot was considered easy to follow and it was noted that the option to read instructions and/or watch a video was beneficial. The consistency between the two formats of instructions was found to be good by those who opted to use both tools, however most reported using only one format. Only one person needed to contact the support team for further advice and this was not in relation to the usability it was about receipt of the instructions. One person thought the video was too long and detailed and believed a more concise video would be better. Having the option to review the instruction in your own time was perceived as beneficial by most for this pilot phase, though it was noted that for implementation of the system it would be necessary to spend time with staff (clinical and administrative) to go through the system.

'[the training] was good, it was quite you know, sort of concise and very self-explanatory and I watched both the videos, the introductory video and as well as the training video, which I found it was quite useful actually, and it was, you know, to the point' GP2

'The video was quite sufficient for me to be honest, to complete the report' GP2

'The training, I think you know any change is feared in general practice, any new thing, oh how long is it going to take for us to learn? But this was very easy; it was not a lot to keep in mind. And the report that is generated, if you follow the training, it was very easy to complete, yes.' GP4

'Well the video was quite kind of long-winded kind of thing, but it didn't take too long, yeah, no, it was fine. You know it talked you through it in detail. The main problem with it I found that it was, it didn't, it was quite slow kind of thing, a lot of the stuff could be explained a bit quicker, like how to log on and things, it told you quite in-depth how to do that, whereas most of us can do that relatively easily.' GP11

'potentially it could be a little bit faster for all of us, you know, as everything, time is very important, so even doing this training kind of thing, it probably could have gone through it a little bit quicker, for me personally kind of thing.' GP5

'It's fairly, it seems fairly straightforward to me. Yeah, I mean I thought it was pretty, it's quite user-friendly, it pulls all the appropriate information in, so yeah, no, I thought it was easy to use, and seemed pretty accurate with what it was, what everything that was being pulled into the report from the notes. So yeah. And the video was pretty clear and concise as well' GP6

'The video was quite informative, it was short and sweet I would say. It sort of showed the screens in live mode, so that was adequate; watching it once was easy enough to be able to use the software. I didn't have to go through the written information, I mean for me the video was self-explanatory, so I just went on and did it after that.' GP10

However, it was felt that by some that the system process was not detailed and some reported wanting to understand what happens and when, from the request receipt and after the send-off phase.

It didn't actually mention anything about how we are going to be collecting the data from the notes as such; it just gave us the idea how we are going to be redacting the information that's been given to us. I don't think it has actually mentioned anything about how we are going to be collecting the information from, initially from the patient's records, I think probably there should be a separate video for the clinical staff, you know, usually it's, it would be the case in every surgery. There would be clerical staff and they need to have some sort of training into it, to see how they can put all the information needed, and how they can extract that to produce insurance report. ' GP9

Potential Impact of eMR software use on GP resources

The software was considered quick and easy to use by all GPs interviewed and the potential for release of GP time was noted. Overall GPs noted the report time could be reduced by 30-50%:

'it was very, it was very quick, once you got used to it, the first one probably took me twice as long as all the others, because once I was sort of used to the software, I could just quickly go through it then and …but I think as you'd use it more, you'd be even quicker really' GP1

'I think it will probably [reduce the time taken to complete reports], you know, especially when there is a prolonged report, like medical insurance report request, that will, that's the one which takes most time for us actually to do, and you know if there was something like this, and I'm sure it can actually you know half the time or even less I suppose.' GP2

'work [for reports] is done by printing out and then manually redacting, so it obviously significantly reduced some work off the members of staff' GP2

'There would be massive impact for all three parties involved, because insurers are going to get these reports back very quickly, because this current day and age, when the NHS and GPs are so stretched, I think the reports there, there's one report that is sitting here on my desk for the last two months. It's just that I couldn't find the time, so this delays the insurance company in getting the report back, so that the

patient won't be getting their insurances sorted out, their critical illness cover, everything gets delayed. I think this will make the process so smooth that it will all be done very quickly - as and when you receive it. I think the reports will be generated and sent back in less than a week really, with this new one.' GP4

'I would say 100% [that the software can simplify the process of completing a report], because as I say, [I currently have] these eight reports [to complete], I wish I had the software because I know I can complete in thirty minutes probably, all those eight reports [I have waiting to be done]' GP2

'[Using the eMR software relative to current practice] I think then it would be half the time at least… It's much easier and it doesn't take that much time, and it could free up the staff time to do something else' GP9

'I would say at least … 30 to 40% it has simplified the process.' GP11

'The software brings the request directly to the GP, for us to be able to do it from anywhere, and not necessarily from the computer. It will definitely speed it up. Plus, the time taken for each report will be much shorter because it's all pulled out of the clinical system, and it's given in a separate screen, which is easy to look at.' GP10

Positive but tentative comments included hesitation to approve of the software until it had been tested with 'real patients:

'The only concern is if the software hasn't pulled out all the information necessarily, then it's the doctor's, or the person who is doing the report's responsibility to look at the full report, glance through it, to make sure that everything which is needed is in the report. So … I think till we know that the software is capable of pulling out all the information, we'll have to take a little bit extra care in looking at the full report as well, to make sure that everything needed is there' GP10

Delegating the report tasks

Though the report can be prepared by support staff GPs feel that the final review of the report has to lie with the GP; once the system has been thoroughly tested the GPs may feel better able to delegate some of this work to support staff.

'I think in terms of the administrative person's time, there is the potential to perhaps reduce the amount of time taken. But we should still, I think we still need to have an administrative person to oversee things because a lot, a number of GPs doing things differently, so there has to be somebody there to support the admin person' GP10

'there are going to be situations where you may have the, kind of you will have to have the medical knowledge to pick up on things, like for example, if it was an issue of patient coming to, for something like itching and it turns out to be jaundice. But the report software picked it up rightly, but the admin staff may not know the significance of the diagnosis with regards to the condition that was asked for.' GP4

'I don't think you can ever fully trust the coding on our software. So I think, I think certainly you could have admin, you know, clerical staff doing the report, but I think it should always be at least viewed by, by a doctor to be honest. So I, that's my personal … I'd be wary of just doing that because obviously you know there's quite significant repercussions to some of the stuff that's in here, in terms of the

insurance and things, so I think I'd, I'd … I think it should always be reviewed by a clinical physician.' GP6

'[administrator] would have been able to follow with the same ease, the only thing that she might be finding it difficult is the training mentions about making you know free text commands certain parts of the report, which is basically medical, you need medical knowledge for that, and then sometimes redacting certain things and adding certain things, again, that's going to need medical knowledge. Plus when you look at the report, it asks for certain aspects of the medical problems, so it's a person who, an administrative person who is … looking at the training video will appreciate what the process is like and how she would do the reports, but I don't think an administrative person would be able to do the report by themselves, without help of a GP.' GP10

General comments

Some of the GPs found that the software taking you back to the top after an edit was unhelpful. A few other recommendations to support the eMR software development were also made:

'It's very easy, the only thing that I was thing is you know, so if it was just going back to the top of the page all the time, once you have a patient, for example, if you have patient that changed a few medications. And put the update for that column, it just bumps back to the top of the page actually. If you could stay back, if you, once the top place it's come back to the same place, then it's much easier, rather than just going up and down.' GP9

'One thing I would comment is if I press the 'update' button in any one of the sections on the report, it takes us right to the top of the report again. Which is sometimes a bit of a problem, because you'd have to then scroll back down to the place where you left it. So that might be something that I would want to see change if possible, where you click 'update', that particular section should get updated, but then the screen shouldn't jump back to the top again.' GP10

'Some insurance companies ask for specific questions about periods of sick, with various ailments. Now I know the sick notes do get pulled in to the system but I, it will be good to have a separate box which basically just pulls out all the sick notes in one section, so insurance companies will be able to have a look at it in chronological order. So that might be something that, if it's possible to be done, it would be useful' GP10

'Sometimes the insurance companies want us to give general comments about the overall medical report. I know there is a free text box for each and every section, but it might be useful to have a … another separate section for general comments, if any, so that the GP can write anything if necessary' GP10

'I guess the only thing I would add is that … in terms of where the problem page is, you can't, I know you've got, there's a manual box that you can write in, but there's no, you can't actually add another problem, if you see what I mean. So that's the only other thing, it might be useful to be able to actually add in to the active problems as a code, rather than just a manual sort of text box' GP6

There were mixed opinions about the ability to access the software remotely, e.g., access from home was not a feature that the GPs thought was important per se, they could see the use for it, though most noted they preferred not to take work home.

'This day and age, when there's so much pressures on NHS, I would probably may have to do that in the future. We've all got access to blood test results and patient records at home, so … a lot of GPs

that I know of do a lot of work before they come into work, they do look at all the results and stuff at home, so that they are less pressured in their work. So this may be the next thing that we might be doing from home' GP4

'I think it will be quite helpful towards generating the report in time, and also… not all the GPs have it, but if we have an encrypted software, you know, the computer system we carry around, then we can use it you know maybe in the evenings, after the surgery hours. Yeah, I am more than happy to use those functions, because if it is only like one report or two reports in a week, then you can get it done sooner, rather than waiting to go back to the surgery, and then either clinical workload distracts you and then yeah, there are other admin work as well, enough to distract you from submitting the report.' GP11

Recommendations to support implementation were offered in view of how the training could be offered:

'maybe face to face training, I think that's what's probably would be ideal when it's launched for the admin staff, but I think the GPs will be able to follow this very easily. But maybe bodies on the ground to teach the admin staff on how to handle the process when it comes through might be useful' GP4

'in terms of bringing it to like practical use and Vision software or EMIS software, obviously you would need training if anything/everything is going to change …' GP7

'It would be ideal to have a portion in the video saying, you know, say for example if there is a request asking for direct, these conditions for the station, how to input that into that software and how to get the information out of the notes. That portion should be included in the video if you are going to be training the clerical staff with that.' GP9

Fixed fees for eMR generated reports

GPs felt a fixed fee rate was likely to be considered unacceptable by most practices and noted that low fees were the reason they had not engaged with the iGPR system:

'I think … [the fee] should be a bit more. It is because, as you know, general practices are all businesses themselves. A lot of their future planning is based on their income this year. So there's going to be reduction of almost 50% in their … income because of us having £50-60 to normally would have been £90-120. It may not be acceptable for a lot of surgeries. And this is the reason why we didn't use the competitor's, iGPR, programmes on our systems, because they are offering low … payments.' GP11

'it all depends on how complex the report is going to be and what is the length of the report, and how much time is being spent by the doctor or the person who's doing the report. So we can't really have a fixed charge …' GP10

'I mean I think some people argue that it's not just about the time, it's about the, the fact that we're putting our signature to it, and it's about taking the responsibility for that report. There's kind of two, two sort of sides to the payment, if you see what I mean, one is the, the time it takes, and one is just the responsibility that you attribute to it.' GP6

Perceived challenges for eMR software utilisation

One of the most commonly perceived concerns expressed by GPs was not in regards to the eMR system per se, but related to having 'comprehensive data' for the completion of an electronic request, i.e. GPs lacked confidence in historical clinical coding pertaining to their patients' medical history, thus, issues affecting existing data quality were thought to impact full eMR software utilisation, expressed as uncertainty in regards to how the

software would be able to support data quality issues. Mainly GPs felt that they 'may as well' continue with current practice if they would be required to 'double check' for any discrepancies. This concern was extended to the software's ability to 'read' and extract information from text fields and clinical notes that are not coded. Having to still search through paper notes was similarly considered an arduous process that the software would not be able to facilitate. Concern about lack of flexibility relating to setting their own fee rates were also expressed, GPs rely on this income as part of their funding stream and for some the potential to have their income stream significantly reduced was not an attractive feature. Specifically, GPs felt that it was not only the time committed to the process that was valuable to non-NHS 3rd party organisations, but equally their medical expertise, and which they believed was important to recognise through this monetary remuneration. This was further emphasised by GPs highlighting that the task of medical reporting was not something which could be wholly delegated to administrative staff as they would e.g., not be equipped with the specialist knowledge required to recognise symptomatic features within the free text medical notes. Some concerns were noted about the software utilisation by the non-NHS 3rd party organisations and whether the eMR reports would be accepted by all for a standardised approach. It was felt that the organisations were unlikely to accept the same format of information for their varying types of information request. It was believed that differentiation in complexity of requests and subsequent forms by the various organisations may hinder GPs in standardising their approach through the eMR software, and as such reduce the impact of the software on their time commitments for producing such reports.

Perceived facilitators for eMR software utilisation

Overall the potential for release of substantial GP and administrator time was seen as one of the main drivers of change from current practice to software adoption. The ease of use generally of the eMR system along with the unambiguous design were also seen as facilitating the system implementation for report production. The coherent approach to redaction, and system functions such as electronic submission of the reports, were seen as supporting GPs in safeguarding patient information. Such features could also instil confidence towards meeting the GDPR requirements. Immediate access to patient consent for release of the information was seen as helpful in regards to improving the speed of processing as well as being a reassuring feature for the GPs. The training instructions for the pilot were positively remarked up on and all GPs felt they were readily able to complete the task with this minimal support for the purpose of testing the system. It was noted that for the implementation phase the training would need to include further information about the complete process (from the initial request appearing at the GP desktop through to receipt of the completed medical report by the 3rd party organisation) as this would facilitate greater awareness of the importance of each step required. It was felt that in-house training for GPs and administrators at individual practices would support uptake and actual use. Being asked about their preferences and having input in to the software development was welcomed by all the GPs, who believed the succeeding coproduction of a meaningful system would greatly support the integration and implementation of the software.

4.3.2 Health Technology Consultant Interview

An opportunity arose to include the insights of a key informant with expertise in health technology implantation. Our informant was able to disclose a personal view based on years of experience of supporting primary care organisations with technological advances to support their practice. The main insights from this interview pertain to the lack of technological expertise within primary care and the difficulties this pose in regards to successful implementation of potential useful systems. Firstly GPs are not aware of available software solutions and rely on external expertise to support them in the selection as well as adoption of available systems. Many of the available systems further lack the accompanying support and training packages which GPs require, a recent example of this was provided in regards to the current main provider of electronic medical reports, iGPR. The introduction of the iGPR system was described as underwhelming with no end user consultations being undertaken and no training support provided. And again it fell on external advisors, not affiliated with iGPR, to

support GPs with understanding the software and system functions, processes and how these can be utilised to support GP and administrative workloads. Data quality concerns is a recurring issue and again the lack of understanding of due system process is hindering full system utilisation as well as allowing for improved data quality. It was thus highlighted that data quality reviews and the provision of targeted training alongside software implantation would be particularly valuable to GPs. It was further highlighted that GPs have a 'low threshold for error'; specifically this means that if a new system does not operate optimally at first try then GPs are unlikely to pursue its use. Given their busy workload it is understandable that GPs seek to preserve their time and it will be important for any new system gain the GPs confidence through quality, accuracy and dedicated support.

5. Discussion

5.1 Evaluation Findings

The exploration of the medical review landscape found that the changing demands in healthcare provision is putting additional pressure on already busy GPs, there is a national focus on supporting GPs as well as wider health care organisations in responding to the increasing demands through implementation of electronic health care management systems. Thus there is a clear need to release GP time, which was supported by the interviews, and indeed, one of the main drivers for eMR software application was found to be the potential to release such resources. GPs are aware of the software support but often do not understand how it can be utilised appropriately. The literature explicitly notes that merely providing software solutions is not enough to facilitate the changes needed; an accompanying focus on supporting health care organisations through implementation of available software solutions is required along with support for end users to acquire the knowledge and confidence required to utilise these tools effectively and efficiently. Though historically such additional focus may have been perceived to be outside the remit of software developers it is essential to include training and support packages along with their products, and to further liaise with those in the field that has the expertise and capacity to support end users in implementing these tools within their practice. When implementing the software it will likely be important to offer clear and targeted training that demonstrate not only how to use the software but also how and when the software can be used; feedback should be provided regularly during the initial trialling and frequently thereafter to ensure that the system is fully integrated within the practice.

The findings from the MediData survey and the GP interviews further support the notion pertaining to the 'attitude-behaviour gap' recognised within the literature; GP stakeholders all reported having access to software that could potentially support their workload management, yet the majority stated not having made use of these tools, or not having explored the full potential of system features available through such software. Interestingly GPs and our key informant reported that the current main provider of electronic medical reporting software, iGPR, had not engaged end users in their system development, nor had any training been provided alongside this system implementation, thus leaving it underused by practitioners. This further emphasise the importance of sensitive and targeted opportunities for GPs and support staff to enhance their awareness as well as practical skills of how to utilise available software. The discussions highlighted that greater understanding as to why existing electronic systems / available tools are not being utilised is of importance for all new software developers as this can support implementation of their products to ensure they are meaningfully acquired and that the tools are used to their full potential. In this regard the discussions with GPs revealed that MediData have already uniquely positioned themselves as a quality developer by including the software end users in their product development; the co-production of a system that clearly identifies the end user needs along with preferences is as such likely to facilitate implementation of the system and support current practice change to accommodate the GP workloads.

Albeit with a limited sample the brief MediData survey and subsequent descriptive analysis found that the system design, function and complimentary training were found to be sufficient; the respondents further described the software as having the potential to release valuable resources such as GP time and further improving the timeliness of medical report returns. The GP interviews offered further insight into these findings as GPs were able to elaborate on their current experiences and detail their perceived impact of the eMR software. This was particularly pertinent in regards to exploring the fee options where the survey reported that the lower rate of £60 would be acceptable, whereas the interviews revealed that although the improved efficiency may support a reduced fee allocation GPs strongly believed that they were not only being compensated for their time but also for their medical expertise. This was noted as an important point as, even with the ease of use and adequate functionality allowing administrators to prepare the report, medical expertise is required to accurately and meaningfully interpret the medical notes. GPs were also concerned about the reduced income for their practices by accepting what could be effectively be seen as half the fee they are currently able to claim. Importantly it was noted that one of the reasons the existing software, iGPR, is underutilised is due to offering low fees for report returns. Thus, it will be important for MediData to establish if the reduced fees are of importance in engaging 3rd party organisations or if increased speed of report returns may be of greater value to these organisations. Acknowledging GP expertise is certainly important to engage them in the change process, and the ability to request their preferred monetary compensation may be one way of attributing this value.

One of the key barriers to software use identified was GP perception of data quality; the interviews revealed that GPs lack confidence in the clinical coding and written records of patient consultations within their historical medical records. Again, addressing such concerns may previously have been considered outside of the developers responsibility, however, to support software implementation it may be essential to be able to conduct a system diagnostic for data quality; such a task could be undertaken by the developers or in collaboration with the GPs own technology advisers with the aim to increase GP confidence and capacity to use the software as intended. Such a diagnostic may also reassure GPs that the perceived hindrance and impact historically 'inadequate' data may have on utilisation of the software is minimal. Understanding the limitations of current data entry practice, as well as historical entries, may enhance good practice and ensure quality of coding and note taking from consultations is maintained. Importantly addressing data quality issue concerns alongside information about the software processing of medical data would likely instil confidence in the eMR software meeting the new GDPR requirements.

5.2 Limitations

Although this initial exploration of the eMR software reception was intentionally condensed with regards to stakeholder engagement it should be noted that the minimal representation across stakeholder groups has limited the overall perspective we can take on the eMR software. The inclusion of patients and other end users such as insurance companies, the DVLA, the DWP were not consulted about what they perceive as barriers for speedy completion of report requests; it would also have been interesting to know if the 3rd party organisations value increased speed to reduced fees. This is particularly relevant in regards to GP concerns about low fees being related to use of electronic medical reporting Furthermore, within the participating general practices practice managers and administrative staff were not consulted about the ease or difficulty related to their supporting part of the medical review process. It would have been interesting to also know their views on any issues pertaining to obtaining payment of fees given and any impact on the report return timeliness, given that GPs reported that reports are not released until fees have been paid. This particularly relevant in regards to the payment transfer feature available for use with the MediData eMR software.

5.3 Conclusion

The MediData eMR software was well received with GPs favourably describing the design, functionality and potential for impact on GP resources. The clinical and technical report demonstrates that the system works as intended with minimal training required for accurate and meaningful production of electronic medical reports. The health technology literature is further supported by stakeholder insights to system engagement and it is clear that software developers, who seek to have their products truly integrated within health care organisations, should be mindful of the 'attitude-behaviour' gap. Co-production of interventions through engagement with the public and patients is now a well-recognised part of intervention development in health and social care as well as governmental initiatives, extending this practice to include interactions between product developers and clinical end users seems a sensible next step for successful provision of any product. As such, albeit previously considered to be outside of their remit, clear steps should be taken by developers to support the implementation process of their products through early end user engagement with regards to design, workflow, cultural change and financial implications in order to optimise product application. MediData have the opportunity to not only act as innovators of unique technology solutions, but also as forerunners of a co-produced system that clearly identifies the end user needs along with their preferences. This approach is likely to facilitate implementation of the eMR software and support current practice change to accommodate the GP workloads as well as uniquely position MediData as a trusted and quality assured developer.

6. Recommendations

Through their early inclusion of end users MediData has established good practice in their approach to the eMR software development; furthermore, a second phase is already planned that incorporates a full process evaluation alongside the wider implantation of the software across the UK. This forward planning and clear recognition of stakeholder value in development and implementation is in line with the recommendations established in the literature and also corresponds with the stakeholder views from this early phase 1 evaluation. Given MediData's intuitive recognition of what is needed there are limited recommendations to be made at this stage of the process in regards to new practice by MediData.

However, some areas of focus for the pre-planned onward processes should be highlighted:

I. As GPs are concerned about poor data quality related to historic coding practices by the surgeries, it will be important for MediData to build up confidence in the technical abilities of the eMR; this can be achieved through continued revision of the software to ensure that the clinical coding and redaction processes are precise prior to UK wide implementation;
    a) The importance of providing software that delivers as described should not be underestimated; with already low capacity within general practices any perceived challenges may lead to instant rejection of a system that is not able to circumvent any perceived issues.
    b) Thus, continued and planned testing / revision of the eMR software functions with GPs for accuracy and usability will be important prior to the Phase 2 'release' to ensure end users confidence in the quality and utility of the software is established from the onset.

II. The planned evaluation for Phase 2, alongside the wider software implementation across UK general practices, should include a review of data quality as a baseline measure within participating general practices and as an indicator of ability to adopt the software; this may also be used as one measurement of change from current practice;

III. MediData should continue its current approach of explicitly including relevant stakeholders in the eMR software developments and extend its remit to include feedback from practice administrative staff and third party report requesters; i.e., for Phase 2 stakeholder engagement should be widened to include:
    a) 3rd party organisations requesting medical reports; this would further the understanding of what constitutes value in medical report returns for these organisations, including views on monetary savings and increased completion rate as facilitators for software adoption;
    b) Patient perspectives on the consent process;
    c) Support staff within GP surgeries that facilitate the non-NHS patient medical reports
IV. Great care should be taken to incorporate lessons learnt from the current literature in regards to implantation practice.
    a) This may include establishing collaboration with GP technology advisors to ensure targeted and meaningful support is provided alongside software implementation, e.g., development of training packages and a regular feedback system that recognises GP software use and as such can offer GPs insight into their practice allowing for better planning and use of resources;
V. Maintaining the independence to regulate their fees is important to GPs and as such it should be emphasised in all communications by MediData that a guide fee only is offered through the eMR which GPs may wish to adopt once they realise the time savings; allowing GPs the flexibility to determine their fees relative to a fixed remuneration will likely enhance software uptake and as such MediData should explore how this can best be incorporated;
VI. Along with the financial incentive for GPs to determine their payment rates it may be useful to explore if a monetary 'bonus' for early return of medical reports may act as an incentive to improve the timeliness of reports; this should be explored as a topic for the 3rd party report requesters as well as GPs.
VII. The preferences for, and acceptance of, standardised eMR reports by non-NHS third party organisations should be emphasised in MediData communications with GPs to ensure any uncertainties around the wider application of the eMR software across report requesters are addressed.

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8. Appendix

8.1. Imision et al., (2016): Seven lessons for success in the benefits of digital health care.

1. Transformation first	**Technology will only succeed if it supports new ways of working**. Where technological interventions have failed, technology has simply been layered on top of existing structures and work patterns, creating additional workload for health care professionals. You need a transformation programme supported by new technology, not the other way round. This is the fundamental lesson that underpins everything else.
9. Culture change is crucial	**You need to invest at least as much in programmes of organisational change as the technology itself (and ideally significantly more).** You will need leaders with a deep knowledge of both clinical and technological systems, a culture that is receptive to change and an environment where all staff feel empowered to spot opportunities to improve. Clinical champions and active staff engagement can help with this. Training is critical. It should be provided to all staff interacting with new technology before it is introduced, alongside real-time support once it is in place. As systems become easier to use, training needs for routine use should subside
10. User-centred design	**Technological systems should solve problems for their users, not create them**. They should support a clinician's 'workflow' (their tasks and processes) as well as their 'thought flow' (their process of clinical decision-making). For example, a decision support system needs to provide prescribing advice at the exact moment the clinician is thinking about prescribing. When systems meet clinical needs they are much more likely to succeed, and when clinicians experience technology making their lives easier, they are much more likely to be supportive of on-going change. To this end, you should involve clinicians in developing systems. You should also customise the information you present depending on who is looking at it.
11. Invest in analytics	**You need to invest in analytics to learn from data collected in clinical and nonclinical systems.** This is likely to improve operational and clinical processes as well as population management and treatment optimisation. Sophisticated search tools will help. You will also need a team of highly qualified analysts and data scientists. This may not be a quick or cheap solution, but the potential for long term gain is enormous
12. Multiple iterations and continuous learning	**Even if you follow all of this advice, you won't get it right first time.** You should see this as an on-going process with several learning cycles – some quite painful – before all of this investment starts to pay off. You will need people who can adapt both clinical practices and the supporting technology as you improve and evolve. It is now routine for large health care organisations in the US to have chief medical and chief nursing information officers
13. Support interoperability	**Sharing data across multiple settings is fundamental to realising the benefits of a paperless NHS**. A lot of work needs to be done at a national level, but there are also things providers can do. Firstly, while customising your EHR is likely to make it more useful to your needs, changing lots of things is likely to inhibit data sharing – so think carefully about what you adapt. Secondly, weigh up the benefits of a single integrated system versus multiple, bespoke specialist systems that are linked together. There is no consensus on what is most effective. A single system will always be the second-best option compared to a purpose-built solution for a particular specialty, but it is more likely to support integration
7. Strong information governance	**Concerns about patient data entering the wrong hands or being lost in error has historically made patients and professionals alike resistant to digital systems.** Robust data security will improve public acceptance. Make the most of tools available to you, such as the Health & Social Care Information Centre information governance toolkit. Whatever processes you put in place, make sure they are clearly articulated to patients – particularly when seeking permission for non-clinical uses of data, such as improving how you work

8.2 MediData eMR instructions

Medidata_GP_usergui
de_v1.1.pdf

8.3 Interview Topic Guide

Interview Schedule – Proposed themes

A. Context

1. Extent of need: How much of your workload do non-NHS 3rd party medical report requests take up?

Clues: -How much of your workload within a week? -How many minutes per report? / -How many reports per week? -Do you do them at your own time (e.g. *lunch-time / after clinical or during GP Practice hours*?) / -How much are you paid per report (*really probe here – reluctant to disclose – give me an example for DVLA / insurers / -Does your GP Practice have their own rates or do you follow BMA fees?*) / Do you use software or do you do it manually (hand written)? / Who get the money (GP who completes the report or the Practice?) Do you manage to stay within the 3 week deadline? (They are usually never submitted on time – ask them why)

2. Current practice: How have you dealt with such requests so far? Explain the process

Clues: What is the involvement of administrative staff? (e.g. getting in touch with insurers) Does the patient need to approve the report before you send it? (it has been mentioned during the interview)

3. Current issues: What are the key issues with such requests? (e.g. efficiency, confidentiality, quality of reporting) Does your current practice meet the new GDP regulations?

Clues: What about reports, which require data older than 5 years? (coding problems and possibly GPs have to go through paperwork manually because of that)

4. Impact: What was the impact of such requests on other work and responsibilities?

B. Training

1. How did you find the training process? (Method of training delivery – was it fast? – was it comprehensive? – communication and feedback from the trainers)

Clues: Did you go through the video and pdf document?

2. Benefits: What did you like about it (=the training)?

3. Room for improvement: What needs to be improved?

C. Software

1. Ease of Use: Has it simplified the process of completing a report? If so, in which ways? (e.g. user interface, navigation, readability, easy is to enter changes etc.)

Clues: If they have mentioned that they used a different software in the past (e.g. iGPR), then ask them to compare between the two. Which one looks better? Which one is faster? Ask them to critically evaluate the previous software. What kind of problems did they encounter? What did they like about it? Does the eMR software cover that? / Are there any features in the iGPR software that they would like to see in the eMR software?

2. Customer Support: Satisfaction with support (online, telephone support etc.)
3. Features & Functionality: Are there any features you find useful? (e.g. Auto-redaction process – eConsent forms, templates, mobile access to complete instructions outside surgery times, compliance with the new GDPR regulations and information governance codes of practice) How do you foresee the integration of the software to the system you currently use?
4. Data Security: What do you think of the software's auto-reduction functionality and protecting patient data/ confidentiality?
5. Value for Money: What is the impact on resources? Does it speed up reporting? Is it time-saving? (Associated benefits on improved speed of obtaining medical review without loss of quality and confidentiality)

Clues: Recap about how much they spend per report with their present system (let's say they spend 30 minutes on average, but that doesn't include administrative assistance) What about any impact on quality of reporting?

6. Impact on patient wellbeing: What do you think would be the impact of using the software on improving your clients' wellbeing?
7. Impact on staff wellbeing: What do you think would be the impact of using the software on improving staff wellbeing? (Remote function/working from home/flexibility, time saving etc.)

8. Potential: If the technology performed everything and more, do you see the £50 per report as a reasonable remuneration? Do you foresee the report writing becoming an administrative task in the future?
9. Potential Barriers: Are there any other issues we have not touched upon that you would like to discuss?

Clues: Would you like some further add-on features? (Did you do the training on laptop/desktop/ipad etc. did you notice any problems?)

8.4 Participant Information Sheet

Evaluation of the Impact of the eMR MediData software on General Practitioner Resources

Information Sheet for Participation in Evaluation Interviews

Version 1.4 - 27th October 2017

Background

MediData Exchange Limited UK is piloting a new software in General Practices within the ABMUHB; The eMR software allows an appropriate patient report to be compiled from the electronic record in a very short time as the electronic request from MediData will only ask for the pertinent information via the specific medical code. The GP can then add relevant context and narrative, concentrating on the area where they can use their expertise and patient knowledge rather than spend time scanning patient data. The eMR process operates with explicit patient consent and has been designed with the aim to reduce the time GPs spend on the report completion and to speed up the time of reporting, thus benefiting the patient and GP as well as the report requester. It is anticipated that the use of the eMR software will reduce the risk of GPs providing inappropriate data by mistake.

The Swansea Centre for Health Economics (SCHE) Evaluation Unit has been commissioned to complete an evaluation for MediData on the initial use of this new software; the evaluation will include semi-structured interviews with GPs that have been invited to trial the new software.

What is the purpose of this evaluation?

The purpose of this evaluation is to assess the introduction of the software solution developed by MediData in partnership with EMIS Health to support GPs in the UK with their provision of patient reports. We are interested in finding out if the aims, such as the incorporation of appropriate and relevant patient information, reflect the insights provided by the GPs and GP practice managers who decided to take part in this process.

Why have I been invited to take part?

As a GP/GP practice manager, it is important for us to have an understanding of your ideas and insights about the MediData software and issues related to the process, the time taken, the impact on other work and responsibilities. Therefore, we would like to invite you to share your experience of the software along with your ideas on the topic with the evaluation team through interviews.

What will I have to do?

After completing the training to use the MediData software and how to produce the patient reports, you will be invited by the evaluation team to participate in a face-to-face, telephone or Skype interview to discuss your experience of the new software. If you agree to take part in an interview, we will ask you to confirm your participation by written consent. The interview time will vary and is expected to last no more than one hour. We will seek permission at the start of the interview to audio-record the interview, please note that you can still take part in the interview if you do not wish for it to be audio-recorded. Details of this process will be further explained to you upon your expression of interest and as part of the consent

form you will be asked to sign when agreeing to participate. All data collected will be anonymous and any individual quotes used for our report will not be identifiable.

What will happen to the evaluation findings?

The evaluation findings will form part of a report for MediData and will contribute towards the further development of their software. The interview information is confidential and the report will not include any names or details of individuals who have taken part in interviews.

Who can I contact for further information?

If at any time you have any questions about taking part in the interviews, please do not hesitate to contact Alexandra or Liv at SCHE using the contact details below:

Dr Alexandra V. Sardani

Email: A.V.Sardani@Swansea.ac.uk

Dr Liv Kosnes

Email: L.Kosnes@Swansea.ac.uk

Phone: 01792 602049 / 602117

8.5 Participant Consent Form

Participant Consent Form

Evaluation of the eMR MediData Software

	Please initial box
1. I confirm that I have read and understand the information sheet dated: 27/11/2017 (version 1.4) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason and that my legal rights remain unaffected.	☐
3. I understand that my interview, though recorded, will remain anonymous with anything I say treated in the strictest confidence, and that information that may result in anyone being put at risk of harm may have to be informed to the appropriate authorities.	☐
4. I give permission for anonymous quotations to be used, as appropriate, in written and verbal reports of the study.	☐
5. I agree to take part in the above study.	☐

_____	_____	_____
Name of Participant	Signature	Date
_____	_____	_____
Name of Person taking consent	Signature	Date

9. Further Information and Contact Details

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