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**An investigation into the current workflow
of a melanoma service utilising an
Electronic Patient Record.**

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A dissertation submitted to Trinity College Dublin, in
partial fulfilment of the requirements for the degree of
Master of Science in Health Informatics

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics, Trinity College Dublin.

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Abstract

Background

In 2013 a strategy for the introduction of a national Electronic Health Record (EHR) for the Republic of Ireland was launched. The objective of this is to implement a nationwide electronic system that will link up electronic patient records in healthcare institutions across the country. The intention is that the patients' medical information will follow them through different facilities allowing for information sharing. The purpose of sharing this information is to avoid adverse events occurring to patients, unnecessary replication of tests and better continuity of care. It is also expected that this will prevent needless delays in treatment while the patients' information is sent from other institutions. Many countries have been using various forms of Electronic Patient Records for several years. In Ireland we are uniquely positioned to learn and benefit from the experiences of these countries when looking to implement our own eHealth solutions. However, very few Irish healthcare facilities have had the benefit of the use of an EPR. One public hospital in Dublin has an established EPR that has been in situ for several years. This system is utilised by the melanoma cancer team to coordinate the care of patients.

Research question

The hypothesis for this study is that all members of the multidisciplinary team utilise the current EPR for the melanoma patient pathway. The purpose of this research therefore is to assess the experiences of the diverse members of a team involved in the care of melanoma patients. The goal is to discover how they use an EPR in relation to the workflow of the service and whether they find it to be a useful tool. The aim of this is to try to understand how an EPR is utilised in an Irish setting and if it complements the work of a multidisciplinary team (MDT) and benefits overall patient safety. Is the EPR a useful tool in the care of cancer patients?

Literature review

A literature review was carried out to establish current thinking in the fields of Health Information Technologies (HIT) as well as current research in clinical areas relating to skin cancer, clinical pathways and patient safety.

Methodology

A quantitative research approach was utilised and an anonymised online questionnaire was the chosen method for data collection. Questionnaire answers were then analysed and data was analysed.

Study conclusion

The hypothesis of this study was that all of the members of the melanoma multidisciplinary team used the electronic patient record in the melanoma patient pathway. This was found not to be the case as only a proportion of the team said reported using the EPR in the pathway and for communication; therefore the hypothesis was not proven.

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Abbreviations

ABBREVIATION	DESCRIPTION
AJCC	American Joint Committee on Cancer
CDO	Care Delivery Organisation
CDSS	Clinical Decision Support System
CPD	Continuing Practice Development
CIG	Computer-Interpretable guidelines
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
FDA	Food and Drug Administration
HI	Health Informatics
HIQA	Health and Quality Authority
HSE	Health Service Executive
HCP	Healthcare Professional
HIS	Health Information Systems
HIT	Health Information Technology
IT	Information Technology
KPI	Key Performance Indicator
MRI	Magnetic Resonance Imaging
MRN	Medical Record Number
NCCN	National Comprehensive Cancer Network
NCCP	National Cancer Control Programme
NCHD	Non Consultant Hospital Doctors
NCRI	National Cancer Registry of Ireland
NICE	National Institute for Health and Care Excellence
RT	Radiotherapy
OPD	Out Patient Department
SLN	Sentinel Lymph Node

TNM	Tumour, Node, Metastases
WHO	World Health Organisation
WLE	Wide local excision

Chapter 1

Introduction

In keeping with international and European standards eHealth Ireland has been tasked with the implementation of a national electronic health record (EHR) for Ireland (Ireland, 2013). As we move away from traditional methods of health care delivery the introduction of health information technologies (HIT) has provided a more innovative, faster, safer and more up-to-date solutions for current healthcare delivery (Communities, 2004). However, this current shift in practice can also present a myriad of problems in relation to providing evidence based, and workable approach to HIT (Bain, 2015). It could be argued that the introduction of HIT in Ireland has been less than expedient in comparison to other countries, in particular the European and North America countries (Cresswell & Sheikh, 2013). Healthcare professionals in Ireland have must now recognise that the well-developed, informative use of HIT is an extremely valuable tool to assist in the delivery of quality healthcare in this country. Hence, the delivery of healthcare in Ireland is experiencing significant change in the methods in which we source, gather and analyse critical medical information. Further to this is the obligatory shift in the clinical setting towards implementing evidence based practice and care. It is important that all healthcare professionals are cognisant of the very obvious benefits and improvements that HIT can deliver to the healthcare system. These changes must mean an increase in the use of guidelines, protocols and clinical pathways to aid and guide the practice necessitating changes in clinical workflow. A thorough understanding the needs and work practices of different clinical areas will help to produce a solid foundation from which to design and build appropriate IT solutions for healthcare (Mair et al., 2012). The purpose of this study is to provide an overview of the workings of one multidisciplinary team in a large Dublin university teaching hospital. This particular hospital has seen significant growth with traditional clinical work practices now merging with more widespread use of technology.

1.1 Background

In recent years Irish healthcare has seen rapid and uncompromising changes. A move away from traditional methods of healthcare delivery means changes to long established work practices. Emerging government directives for the implementation of health information technologies necessitates the need for up to date IT systems. These systems must accurately capture and map the patient journey from the start of the patients' medical consultation to their discharge from the healthcare service. Hence, it is important to note at this point by developing IT systems

within the healthcare framework, the use of IT can provide more accurate and precise information to assist clinical diagnosis and treatment planning. It could be argued that HCP are working with increasingly limited resources, hence the need for a more innovative approach to ensure patient care, patient safety and optimal patient outcomes. The emergence of evidence based practice and the increasing use of guidelines and pathways in the clinical field must be captured in a more structured, accurate and informative manner. Electronic Health Records (EHR's) have been proposed as a more efficient way in which to improve many aspects of the delivery of healthcare (Commission, 2012; Ireland, 2013). Most Irish hospitals and in particular the Dublin academic teaching hospitals do not have comprehensive data systems and are still reliant on legacy systems. Many of these systems have not evolved significantly in the past 20 years. The focus of this explorative study is based in one Dublin academic teaching hospital which operates a functioning Electronic Patient Record (EPR) system. This system has been in place for several years and is currently being upgraded to reflect emerging healthcare trends.

The current EPR system in use in this particular hospital was acquired by default and was quite innovative at the time of its instigation. In other words, its emergence and development began back in 2005 when other hospitals nationwide were operating with a predominantly paper based system. However, one such discipline in which the EPR is used extensively is in the area of skin cancer (melanoma melanoma) in a particular Dublin teaching hospital. Several medical and surgical teams are involved in the clinical pathway of the skin cancer patient. Hence, the use of the EPR enables a very specific clinical pathway definition between these varied clinical disciplines.

Currently in Ireland there is no universal agreement upon a particular clinical pathway for melanoma patients. Therefore the concept of a 'pathway' as discussed in this study refers to the patient journey from diagnosis to discharge.

1.2 Research Question

By undertaking this research it is hoped that light can be shed on the use of an Electronic Patient Records in an Irish public hospital. The researcher has chosen the setting of a melanoma service to examine how the workflow of that service utilises an electronic patient record. To inform the argument the following extended questions are posed-

1. Is there a current structured workflow or care pathway for patients diagnosed with malignant melanoma?
2. Is there optimal communication among multidisciplinary teams involved in the care of patients with malignant melanoma?

3. Are there any identifiable ways in which patient safety could potentially be impacted through current use of an EPR?

1.3 Study Motivation and Aims

The researcher has previously worked in several clinical areas over a 23 year career in the health service. These include surgery, cancer care as a clinical nurse specialist and more recently, dermatology. As a result of this experience the researcher is mindful of the importance of ensuring that patients' are treated within optimal time frames with the utmost attention to coordination of service and quality of care. Due to the input of several disciplines and the frequent changeover of staff this responsibility can often fall to one permanent team member. In areas where staff changeover is frequent, the coordination of care may be compromised and therefore the implementation of an electronic pathway in the setting of an EPR offers an opportunity in which timely, quality care can be delivered. Establishing the current work practices of staff usage of an establish EPR will hopefully inform future efforts to guide the development electronic health solutions.

1.4 Outline of Study

Currently there is no officially accepted melanoma pathway in Ireland though work is in progress amongst Irish clinicians to develop one. At present familiar methods are utilised in an ad hoc manner to facilitate a conceptual multidisciplinary team (MDT) pathway. The purpose of this dissertation is to outline the current pathway utilised for melanoma patients, and to establish how much of it is facilitated through the EPR. By establishing current workflow through the EPR it is hoped that this will identify shortcomings. Potentially this will include detecting patient safety issues, clinical pathways shortcomings as well as general EPR use. Recommendations will then be offered on how to improve any potential barriers to care.

1.5 Mapping the Patient Journey through a Pathway

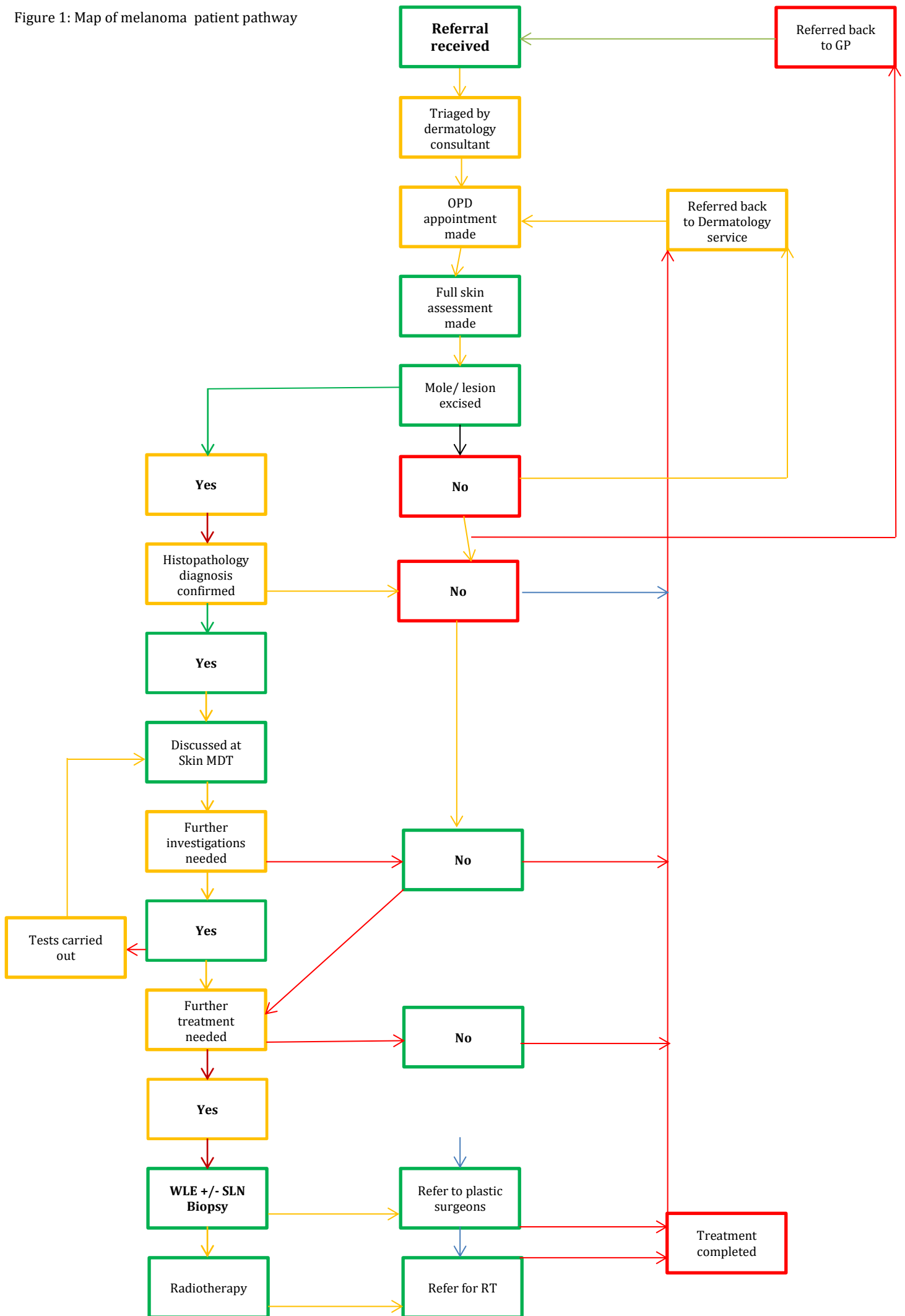
In 2014, while this researcher was working in the department of dermatology at a large Dublin hospital, a collaborative process began. One of the consultant dermatologist proposed that the dermatology patient journey should be visually mapped out. The purpose of this was to better understand the different steps in the patient journey and to identify the different roles of each member of the team. All members of staff working in the dermatology department were encouraged to participate and to input their own involvement. Regardless of the team members' job, everyone was encouraged to identifying any steps along the way, particularly those that appeared to be missing. To ensure all members of the team were free to take part a blank wall

was used to visually map out the journey with 'post-its' and this can be seen in the photograph (Appendix I). This project was largely taken up and completed by one member of staff who went on to present his findings in an as yet unpublished paper entitled 'The pigmented lesion care pathway' (Wall & Johnston, 2013). The pathway outlined in that paper has been slightly reinterpreted by this researcher from her own experiences and understanding. Figure 1 on the following page provides a visual representation of the pathway. Though it does not differ widely from the original, parts of it have been expanded to provide more detail in certain areas.

The object of mapping the patient journey is to show that journey in a simple methodical way, in order to visualise the decision and treatment process flow. The purpose of a visual map of the patient journey is to act as a graphic aid for team members to appreciate where the decision process should go next. From a clinical point, this can be valuable when planning the next step of the patient journey. In many instances pathways have not been formally agreed but are acknowledged as a sequence of actions that have been traditionally undertaken (Kinsman, Rotter, James, Snow, & Willis, 2010).

In this setting a traffic light colour code system has been used to identify areas where the process flow may stall or where the patient could possibly become 'lost' in the system. Green indicates an area of action where there is a uninterrupted flow in treatment, orange indicates where the process may become stalled and red indicates where the patient could become lost to follow-up, particularly in the hospital system.

Figure 1: Map of melanoma patient pathway



1.6 Overview of dissertation

Chapter 1 of this dissertation gives an overview of the background of the study including the research question and the motivation for carrying out the piece of research. The patient journey has been visually and verbally mapped.

Chapter 2 contains a review of the literature pertinent to the topic. Malignant melanoma is defined and described. The topic of electronic patient records are explored and discussed looking at the literature to support their use as well as the case against their complete dissemination. The themes of workflow and teamwork are discussed in relation to their impact on the working environment. And finally the value of the multidisciplinary team in the smooth and effective running of a cancer service is explored.

Chapter 3 provides details of the methodology used in carrying out this piece of research. Different methods of research are discussed and a justification for the method chosen is provided. The questionnaire compiled to answer the research question is outlined and the process which resulted in its use is discussed.

Chapter 4 provides the results of the questionnaire answers and analysis of the findings.

Chapter 5 discusses the findings outlined in chapter 4.

Chapter 6 provides the conclusion of the study and outlines the shortcomings and limitations.

Chapter 2

Literature Review

2.0 Introduction

This chapter contains a review of the current literature on themes deemed to be pertinent to the research topic. Malignant Melanoma is explained in the context of the clinical setting. Electronic patient records are discussed as well as patient safety, workflow and clinical pathways. The purpose of a literature review is to present a clear understanding of the topic by putting forward a critical review of the literature being assessed and to identify gaps in the knowledge base (Ridley, 2008). The literature assembled and presented is used to strengthen the argument in this research and to support the hypothesis.

2.1 The Irish Setting

In the early 1990's the Irish government acknowledged the need to update, upgrade and centralise cancer services in Ireland resulting in a lengthy period of analysis and planning. The Department of Health and Children produced a report entitled 'Cancer Services in Ireland: A National Strategy (Children, 1996)'. This was a follow on from an earlier review of the cancer services in Ireland entitled 'Shaping a Healthier Future'. The original report and the later strategy document identified the need to improve cancer morbidity and mortality outcomes by introducing an innovative care and treatment plan to be delivered in specialised cancer centres. The Strategy outlined a plan to provide 'effective prevention and appropriate screening services; good diagnostic practice; and well developed treatment services'(Children, 1996).

Following on from this in 2006, The National Cancer Forum outlined the need for designated cancer centres to be established in specifically identified university teaching hospitals in the public service which would include dependable, well established multidisciplinary teams to oversee the care of these patients. These teams would consist of experts from surgical, medical, radiology, histopathology and allied healthcare professionals who would be involved in the diagnosis, planning and implementing of patient specific care. The forum also identified the need for 'the development, diffusion and use of health technologies' (Children, 2006). An eHealth policy for Ireland was then produced with the aim of introducing electronic health technology into Ireland (Ireland, 2013). In order to assess and monitor cancer care delivery, the National

Cancer Control Programme (NCCP) was formed in 2007. It's remit was to 'ensure that all elements of this cancer care policy are delivered to the maximum possible extent' (HSE, 2016). This would include specific timelines for the referral, diagnosis and treatment of patients with a suspected cancer and would assess reason for and hold in institutions to account where targets were not being met. Though there is no specified centre of excellence in Ireland for skin cancer the NCCP has designated specialist centres. These centres accept the National Pigmented Lesion GP Referral Form (Appendix E) and must see, diagnose and treat patients within a specified period of time. The initiation by the NCCP of specified centres for skin cancer provides a more structured and transparent patient journey. Standards are set and care is assessed to ascertain that targets are being met and treatment is being delivered in a timely manner. Suspected skin cancers generally follow the pathway outlined in Figure 1, however this may vary somewhat depending on the patients' own specific journey.

The combination of a more structured cancer care strategy and the need for improved electronic systems in which to deliver this care has shaped a revised cancer care delivery strategy. Importantly the NCCP set out a timeframe in which patients must be seen and treated. And with the new Activity Based Funding (ABF) plan where the 'money now follows the patient' hospitals must now demonstrate and provide significantly improved transparency in how they allocate cancer care public funding (HSE, 2015). The need for these strategies in the Irish healthcare system have arisen due to an increase in demand for cancer care services from an ageing population, limited resources and an ever increasing demand on cancer care services (OOCIO, 2015). The process of improving cancer service delivery has been a slow progression. Added to this, the need to improve the electronic data landscape has provided an additional challenge. However, the proposal for a national Electronic Health Record (EHR) system offers an ideal opportunity in which to explore the current utilisation of a working electronic patient record (EPR) currently in existence, in one Dublin public hospital. As EPR's not been widely disseminate throughout the public health service, there is significant potential to learn from this model currently in existence and to apply those lessons to the planning and implementation of future systems, specifically in the Irish setting.

2.2 Malignant melanoma

Malignant melanoma also referred to as cutaneous melanoma is a form of cancer that primarily affects the skin but may also develop in the eye. This type of skin cancer most commonly occurs on the arms, legs and trunk and is identifiable by a number of discernible clinical characteristics which includes abnormal moles with an uneven border (Gabree, Patel, & Rodgers, 2014). Several risk factors for melanoma are known to include, over exposure to sun and UV light, a history of

sunburn, fair skin, having numerous moles and a family history of melanoma (Erdman et al., 2013). The ABCDE criteria, as seen in Appendix G is commonly used by physicians as an aid to the diagnosis of melanoma. This system allows for the identification and classification of abnormal moles or discolouration of the skin and can be used by the Healthcare professionals (HCP) but also be used by members of the general public to detect any changes in skin pattern and to observe for any alterations in shape, colour or size of moles (Rajpar & Marsden, 2008, p. Pg. 38).

2.2.1 Occurrence and prevention

Malignant melanoma occurs most commonly in regions of the world with fair-skinned populations. It has an incidence rate of approximately 80% of new cases worldwide occurring mainly in North America, Europe, Australia and New Zealand (Schoffer et al., 2016). In recent decades the mortality rate from melanoma has been on the increase with an incidence rate of greater than 75% (Registry, 2011). Melanoma is the fifth most common cancer in Ireland, with rates of diagnosis showing a steady annual increase over the last number of year, particularly since the since the early 1990's (Registry, 2015). Figure 4 shows this upward trend in melanoma occurrence in Ireland from 1994 to 2013.

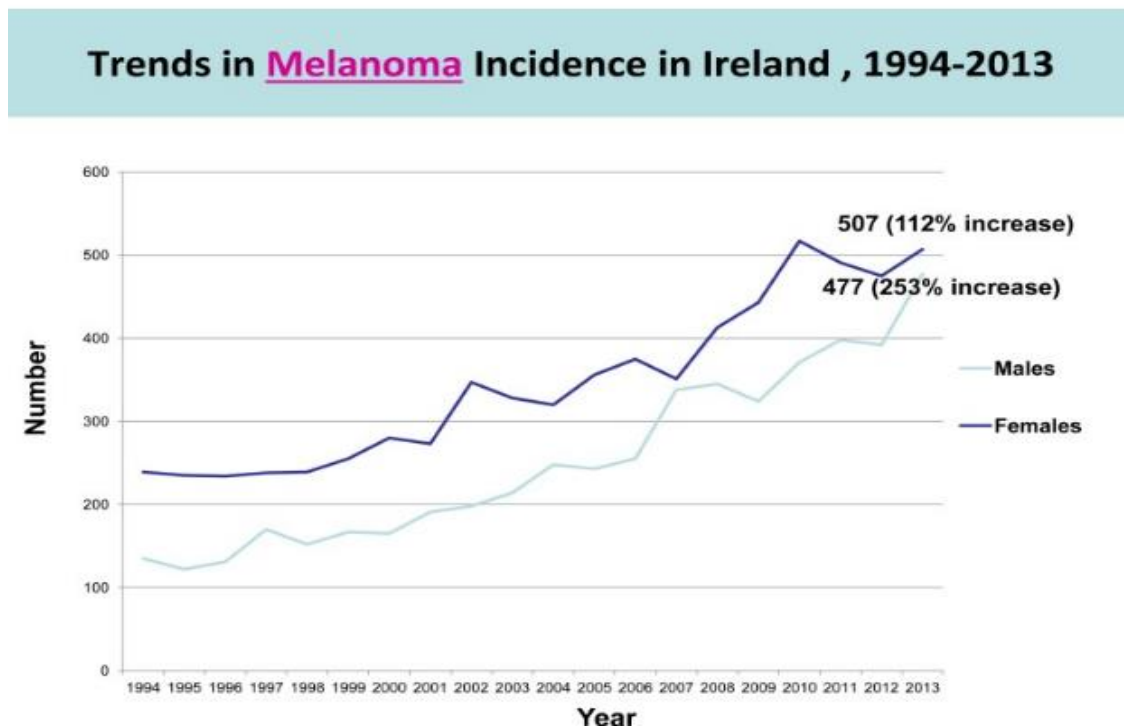


Figure 2-1: Trends in Melanoma Incidence in Ireland, 1994- 2013

(Source NCRI)

This evidence also reflects in the European data which shows a rapid rise in melanoma occurrence rates in more recent years, with the expectation that numbers will continue increase at the current rate (Arnold et al., 2014). Indeed, Garbe et al found that 'in Europe the incidence rate is 10- 25 new melanoma cases per 100,000 inhabitants; whereas in the United States of America (USA) it is 20- 30 per 100,000 inhabitants; and in Australia, where the highest incidence is observed, it is 50- 60 per 100,000 inhabitants' (Garbe et al., 2016). Clearly the increasing incidence rates of skin cancer shows a worrying trend that is not confined to or more common in one specific country. Maintaining current registries of the rates of melanoma occurrence ensures that countries develop appropriate cancer strategies. Ferlay et al found that 'understanding occurrence rates of melanoma and gathering 'up-to-date cancer incidence and mortality data are a key resource in both planning and assessing the impact of cancer control programmes at the country and regional level' (Ferlay et al., 2013). It may be argued that this is not only pertinent to melanoma but would be applicable to all cancers. However in the case of melanoma internationally shared data can inform us in regard to planning cancer strategy programmes. We can learn from other countries with growing incidence rates; as there is a large number of fair skinned individuals dispersed throughout the world, combining and sharing knowledge internationally will better inform those tasked with agreeing on international guidelines and protocols.

Melanoma prevention and awareness play a primary role in reducing the growing rates of occurrence. Worldwide, particularly in countries with skin types prone to developing melanoma, campaigns have been undertaken to educate the public about the dangers of sun exposure and more importantly the risks of becoming sun burned. The importance of wearing sunscreen, the need to keep exposed areas of skin covered and to avoid direct sun exposure particularly when it is at its strongest at certain times of the day is the key message of sun protection campaigns. The Antipodean Slip Slop Slap campaign started in the 1980's is perhaps the most well-known of the public awareness campaigns. It has become renowned worldwide and has been used and adapted by different countries to present the same vital message.

Although there appears to be greater awareness amongst the public about the danger of sun exposure, after so many years of campaigns to educate people, evidence unfortunately suggests the use of sun screen may actually increase the length of time some people spend in direct sunlight, believing that they are fully protected by virtue of the fact that they are wearing sunscreen (Bastuji-Garin & Diepgen, 2002). Inevitably therefore occurrence rates will continue to rise as will the number of deaths from this very preventable cancer.



Figure 2-2: Slip, Slop Slap campaign poster: Referenced from SunSmart.com.au

2.2.2 Diagnosis and management

Guidelines recommend that all patients with a suspected melanoma should be referred to a specialist centre where they can be managed by a dedicated multidisciplinary team (Dummer, Hauschild, Lindenblatt, Pentheroudakis, & Keilholz, 2015). Diagnosis and treatment should only be carried out at these specialised centres. Furthermore it is imperative that no suspicious lesion should be removed in primary care settings as this can affect the overall accuracy of diagnosis 'which in turn determines prognosis and defines adjuvant treatment options, and because diagnostic surgery requires specialist training' (Marsden et al., 2010). Though many primary care physicians appreciate the importance of referring patients to specialist centres in some instances these lesions continue to be excised in primary practice.

Following the referral of a patient to a dermatology service, in a specialised centre the 'work-up' of that patient begins. The first step of the patient journey begins by them being seen and assessed by a consultant dermatologist in an outpatient clinic. A full body skin assessment is carried out and any suspicious moles are classified and photographed. At this stage a decision is taken regarding whether an excisional biopsy or tissue sample should be taken of the suspicious lesion. A biopsy allows for a histopathological diagnosis to be made and forms the basis for ongoing treatment. In this case a sample is taken or more commonly the entire mole is excised in keeping with best practice. European guidelines state that a diagnosis should be based on a full-thickness excisional biopsy with a minimal side margin. This is the most accurate way of determining the exact nature of the mole and from this the future care of the patient is planned. This tissue is then sent to the pathology lab for microscopic assessment, classification and grading. Best practice requires that the sample be processed at an institution that has extensive experience of dealing with these kinds of tissue samples (Dummer et al., 2015). Furthermore, Marsden et al state that the pathologist processing the sample should be one that is associated with the Melanoma multidisciplinary team (MDT) and who regularly attends the MDT meeting where decisions regarding the patients' treatment are made (Marsden et al., 2010).

2.2.3 Treatment

Decisions regarding treatment are based on the depth of the melanoma, otherwise known as the Breslow thickness. Treatment options are guided by the American Joint Committee on Cancer (AJCC) pathological staging guidelines for melanoma (AJCC, 2010). Treatment decisions are based on the size of the tumour, the nodal involvement and the presence of metastases otherwise known as secondary spread. International guidelines direct the course of treatment options available and will at this stage involve input from oncologists, radiologists, radiotherapists as well as other allied healthcare professionals (Garbe et al., 2016). A full thickness excision or wide local excision of the mole is the chosen form of treatment and at this stage should be carried out by a plastic surgeon who is ideally a member of the MDT. The presence of tumour in the lymph nodes and/or the presence of metastatic spread to other organs will necessitate the input of oncology and radiotherapy specialists (Marsden et al., 2010). Treatment decisions are discussed with the relevant specialities at the MDT meeting and all available options are presented to the patient at a follow-up outpatient appointment. The clinician will discuss the treatment options available to the patient but will never force a decision on treatment. Guidance, education and best practice information are offered to the patient so that they can make an informed decision regarding their own treatment. Once the patient has decided, the chosen treatment option will then begin.

2.3 Electronic Patient Records

2.3.1 Introduction

Traditionally patients' medical details have been compiled and stored in paper format, and this is a method that is still widely used even in healthcare facilities with advanced HIT systems. Paper based health records, including patient charts are often disorganised and rambling, notes and results can be misfiled or removed altogether and paper charts are frequently misplaced or inadvertently destroyed. This disorder can lead to the healthcare professional having an incomplete picture of the patient's medical diagnosis and condition and result in them having to trawl through previous written entries to determine for example, what tests have already been carried out (Clynch & Kellett, 2015). Time constraints in the clinical setting will not allow for endless amounts of time being spent searching through paper notes and this could lead to the HCP basing any decisions on the most easily accessible data. However, this does not support a holistic approach to patient care and frequently exposes the patient to harm as clinical decisions are made without the full clinical picture (Kohli & Tan, 2016).

In answer to this, there has been a surge towards the adoption of technology in healthcare settings; though some believe that this has not progressed at the rate many would have expected (Cresswell & Sheikh, 2013) (Karsh, Weinger, Abbott, & Wears, 2010). Despite slow adoption rates, for many countries it has become a priority to speed up HIT system installations and large sums of money have been spent implementing various forms of Health Information Technologies (HIT) (Gunter & Terry, 2005). In Ireland, work has begun on plans to implement a national electronic health record (EHR) in the coming years with the expectation that it too will improve healthcare delivery and patient care (OOCIO, 2015). Indeed it has been identified by Healthcare leaders in Ireland as 'a key capability requirement for the future delivery of healthcare' in this country (Ireland, 2013). Exponents of health technologies maintain that it will improve healthcare quality and safety, reduce costs and promote research (Payne, Lussier, Foraker, & Embi, 2016). However, for all of the apparent benefits of HIT's authors have also identified many negative factors in regard to the introduction of HIT. Examination of both sides of the argument then becomes necessary to fully understand the proposed benefits and possible pitfalls of healthcare technologies.

2.3.2 Defining an Electronic Patient Record

The adoption of HIT systems has seen the emergence of several new terms to describe the repositories of health data. Often these terms are used interchangeably to describe very different architecture and this in turn can lead to misunderstanding when discussing these technologies. Most often the terms Electronic Patient Record (EPR) and Electronic Health Record (EHR) are used interchangeably in the literature and can cause confusion if not correctly defined and understood. It is therefore important from the outset to clearly define these two very different systems in order to appreciate their different contributions in the healthcare setting. Overall these systems have the same goal, to improve patient care locally and nationally while also providing efficient and high quality care, though ultimately the national EHR is dependent on an EPR being in place locally (Garets & Davis, 2006). Understanding the difference between these two very different architectures will better inform clinicians, policy makers and IT developers moving into the future. However this may prove more challenging than expected as Black et al have found, the interchangeable use of language 'reflected the nonstandard usage of terminology and lack of consensus on a taxonomy relating to eHealth technologies' (Black et al., 2011). This lack of consensus on a definition is not limited to health IT, however while academic discussion continues, clinical personnel and IT professionals continue to work with a broad definition of these terms. Nevertheless at the outset it is important to outline the differences between these two fundamentally different HIT systems.

An electronic patient record (EPR) also referred to as an electronic medical record (EMR) can be described broadly and simply as a computerised version of the patient paper notes. It is an institution based record that maintains the patient's clinical data. However, the EPR also allows for this electronic chart to link in with other services in the healthcare facility, thereby becoming more of a clinical data hub as well as a repository. The EPR also provides clinical decision support, order communications to pharmacy and radiology amongst others and allows results of tests to be accessed and viewed in one central system (Protti, Dip, & Johansen, 2008). Alternately, an electronic health record (EHR) is a central repository for shared patient information. Most importantly it allows the patients information to follow them 'through the various modalities of care engaged by that individual' and be accessed by different healthcare professionals, located in different institutions allowing for a more complete picture of that patients' clinical picture as the data follows the patient (Garets & Davis, 2006).

It is vital that key stakeholders become familiar with the principal taxonomy of new health IT systems in order to engage in meaningful debate on the subject and to assist in planning and implementing these systems. Though there may not be agreed definitions or shared classifications internationally as yet in regard to these terms, a basic understanding of the difference between the terms is essential for the future of inclusive healthcare (HIMSS, 2016).

2.3.3 Electronic Patient Records- The case for and against

Much has been written about the increasing demands on healthcare systems worldwide (Classen, 2011). Ageing populations, staff shortages, increased demands on services and patient expectations have meant that healthcare providers must find innovative ways in which to deliver more with less (WHO, 2008). With the exponential rise of personal computers and portable technology there is an increasing expectation that healthcare IT can deliver quick, easy and instant solutions to the area of healthcare (Dicianno et al., 2015). Weighing the expectations of key stakeholders against capability and resources can be a challenge for IT planners and developers. However, EPR's have the potential to provide efficient, safe, useful workable solutions to replace traditional paper based systems. EPR's can provide clinical decision support and provide faster more efficient delivery of care by potentially reducing waiting times for tests to be carried out and for results to reported (R. A. Miller, Waitman, Chen, & Rosenbloom, 2005). However, this potential does not always translate to systems design or their usability and can result in expensive systems being installed but ultimately not being used by HCP (Johnson, 2006). This may explain why the adoption of HIT has not occurred at the rate expected or desired (Blackford-Middleton., 2005). Understanding why systems are not used and identifying barriers to use can help prevent rejection of new systems by users.

2.3.4 EPR's- what can they do?

Advocates of EPR's believe that some of the many benefits of EPR's include reducing clinical errors, supporting healthcare staff, providing information management, supporting research opportunities, reducing healthcare delivery costs, providing audits tools and promoting teamwork and learning amongst HCP's (Sligo, Gauld, Roberts, & Villa, 2017). One of the many possible benefits of an integrated patient system is that it can support the HCP with making decisions related to clinical management of patients. EPR's can provide clinicians with up to date, evidence based, clinical information, this will allow them to come to a better informed decision regarding a patient, before deciding on a treatment course (Kawamoto, Houlihan, Balas, & Lobach, 2005)). This in turn can potentially reduce medication errors, for example, thereby acting as an aid to improved patient safety. In recent times, evidence based practice has become increasingly important in the clinical field and HCP must show this in their planning of patient care and in the clinical choices they make. However, with the vast array of evidence and research now available to support clinical decision making, it is almost impossible for any HCP to retain all of this new evidence (Cresswell, Majeed, Bates, & Sheikh, 2012). The benefit of an effective well designed CDS system is that it can enable the clinician to make an effective, well informed and up to date clinical choice in regard to treatment (Sittig et al., 2008). Providing the latest evidence on screen at point of care can prove a challenge. A lack of understanding by systems developers of the HCP work practices remains a stumbling block to producing effective system which ultimately leads to poor user adoption; this has been identified as an ongoing problem despite the continuing development of programmes (A. Miller et al., 2015). Bates identified that a fast system, with easily accessible information i.e. on screen at the time of decision making was more effective and had higher uptake then when the physician had to go looking for the information (BATES (Bates et al., 2003). When clinical decision support systems (CDSS) are effective and are seen to be of benefit, user uptake is higher however challenges to implementation, as outlined above, and uptake ultimately remain a low.

A further benefit of EPR systems, as described earlier, is their potential for use in research. As stated earlier the EPR is not only a patient record but also a data hub. This presents the opportunity for access to large amount of patient clinical data which amongst other things can be used for research, adding to the growing base of clinical knowledge, but can also provide real time data for use in clinical audit (Blumenthal & Tavenner, 2010). As the need to prove efficiency of care the area clinical audit has become a vital tool in supporting evidence of practice.

2.3.5 Moving away from paper- benefits and challenges

Hayrinen et al identified several studies that recognised the positive impact of electronic systems for recording thorough, accurate and more complete patient documentation (Häyrinen, Saranto, & Nykänen, 2008). Undoubtedly the process of trawling through traditional patients' paper notes is time consuming and depending on the quality of previous entries, may often be fruitless. Errors may not be easily spotted and can be unwittingly carried forward resulting mistakes being made in treatment planning. Bain noted that EPR's were 'seen as a way to simplify the management of patient information, increase productivity and lower costs associated with medical information management' (Bain, 2015). With increasing demand on HCP's there is now often less time available for patient consultations. HCP's can be rushed and pressurised and may often only read the most recent entry recorded in the paper notes. If note taking was poor or inadequate and hand writing illegible, treatment may be based on an incomplete clinical picture. Moving from a paper based system or one where the institution or HCP is used to only using paper patient charts can also create problems.

The knowledge and clinical experience of the HCP can often impact the use of a new system. Yadav et al examined the impact of the introduction of a new EPR at their institution, moving from a largely paper based system to an EPR (Yadav et al., 2017). They examined note taking and clinical ordering before, when paper notes were used and then again after when the EPR was in place. They found that initially there was a higher rate of inaccuracies in the patient notes on EPR than was found in the paper record. They also found that details of the physical patient exam were less likely to be recorded in the paper notes, paradoxically these errors were made by the more senior experienced doctors than by junior house officers. This could well be due to transitioning problems for example a lack of appropriate training on the new system as they did not report resistance by clinicians to the new electronic system. These difficulties following changeover could possibly point more to the lack implementer engagement and EPR training on the part of the institution than of poor note taking on the part of those using the system (Wright et al., 2015). Indeed, a lack of education and training on new systems has been identified as a major reason for poor acceptance of new HIT systems (Gagnon et al., 2014). When easily accessible, appropriate training was available new users were more than willing to engage with systems and more notably perception was more positive towards the system when training was provided (Goveia et al., 2013). Education, training and readily available IT support before and implementation have been found to be a key element to the acceptance and use of new EPR's (Goveia et al., 2013). Another negative consequence possibly related to a lack of training is the concept of the 'work around'. Though not explicit to the clinical setting it has been described by healthcare authors as a way for clinical staff to bypass or navigate a blockage in their workflow

to achieve their end work goal (von Baeyer & Pasero, 2017). This practice of circumventing an impasse in workflow appears to be not an uncommon practice and though viewed negatively by staff is an accepted work practice in order to achieve the end goal (Debono et al., 2013). Time strapped users who find ways to work around an impasse can potentially impact on patient care, however unworkable systems that prevent users moving quickly and efficiently through their work will often be rejected with users reverting to tried and trusted models of work practice (Karsh et al., 2010).

Furthermore, Gross found evidence that poorly implemented EPR's can undermine team moral and weaken trust in the system; 'with erosion of trust in the systems, individuals had to rely on hyper vigilance, redundant communication, and overcompensation to address gaps they encountered' (Gross, 2016). Indeed many authors have found that key stakeholder engagement is vital to acceptance, utilization and expansion of new HIT systems (Kohli & Tan, 2016). In a systematic review Ross et al identified several studies that pointed to poor EPR user uptake being blamed on systems 'that did not fit well with work practices or daily clinical workflow' (Ross, Stevenson, Lau, & Murray, 2016). This may reflect poorly on users and suggest a lack of flexibility and unwillingness to change work practices. However, the review also found several studies where users experienced a positive impact on workflows and a willingness to engage with new systems. Though not all authors reported a negative experience, Gonzalez et al had a very positive response from doctors who welcomed the new technology when they introduced electronic pathways at their institution. This may possibly be due to the fact that there was positive collaboration and coordination throughout their project between clinicians and IT (González-Ferrer, ten Teije, Fdez-Olivares, & Milian, 2013).

Authors have found as many negative as positive reports of EPR introduction and use. However many HCP are keen to embrace solutions that make their daily working life easier, therefore, encouraging them to embrace new HIT and to change to newer faster systems should not be a difficult process. The key message appears to be that inclusion in the planning and implantation process, of all the key stakeholders and potential future users of any new system is a major driver of uptake and acceptance.

2.4 The Multidisciplinary Team

The multidisciplinary team (MDT) can be described as a group of professionals from a variety of clinical backgrounds, working together to evaluate, plan and carry out an agreed pathway of care for a patient (Ndoro, 2014)). This diverse group can include consultant or lead physicians from different specialities such as surgery, histopathology, radiology and oncology. Junior team members from these disciplines are also involved in the MDT, as well as nurses, specialist

nurses, physiotherapists, social workers and pharmacists, to name a few. The MDT has been recognised as an essential element for the care of cancer patients in providing appropriate and effective care (Borras et al., 2014). Though widely used in cancer care, recently, this form of patient care planning has become the standard in many clinical settings.

The multidisciplinary team operates at all levels of patient care but it is most evident at MDT meetings, when this diverse group of individuals come together to discuss best practice and plan patient care. Authors have recognised the importance of the MDT meeting as a means of impacting on the assessment and management of patient care (Brown, 2012). Though meetings can be time consuming they have proven to be valued by HCP's. Lamb et al found they were efficacious for improving 'efficiency in care through improved clinical decisions, planning investigations, helping when discussing plans with patients, speciality referrals, documentation and patient records' (Lamb et al., 2013). Though some other authors dispute their value and have found that there is not enough evidence to show that patient care improves through MDT discussion (Pillay et al., 2016). Nevertheless, these meetings continue to be used as the standard in cancer patient care with many authors finding favourable outcomes in relation to patient care planning, adherence to guidelines and national standards by those involved (Taylor, 2010). Furthermore adherence to care plan decisions made at meetings have found to be the case for the majority of patients indicating support amongst HCP's for this approach to patient care (Borras et al., 2014). However, on-going assessment and training for multidisciplinary teams have shown to 'improve decision making skills and expedite cancer care', suggesting that a more structured approach that is open to appraisal is a more efficacious approach to MDT meetings (Lamb et al., 2013; Meguid et al., 2015).

MDT meetings function not only as planning forums but also as an informal learning space where experience and the most recent evidence and research findings are discussed (Meguid et al., 2015). Indeed Coiera has recognised the significance of these meetings in relation to the part they play in clinical decision support; he argues that this form of CDS is largely ignored by health informaticians as the push towards computation continues (Coiera, 2000). Verbal communication has been the mainstay healthcare for many years, 'corridor consults', verbal orders and clinical decisions have often been carried out verbally and without being recorded. This can seem frustrating for systems developers when it comes to understanding clinical workflow and planning systems. It is clearly an area that needs to be more closely studied by HI in order to better understand this method of working so that systems are developed to compliment it (Coiera, 2000). With the emergence of health IT authors have indeed begun to examine how this social interaction can be preserved while embracing the modern technology (Kane & Luz, 2013).

However, for the MDT to be successful a good working relationship must exist between teams (Jain, Fennell, Chagpar, Connolly, & Nembhard, 2016). Many authors have studied the communication between teams, at various levels in relation to the interaction between team members but also in relation to team interaction with IT systems. Needless to say authors have found that the multidisciplinary team approach promotes better working outcomes (Korner, 2010). They have sited it as a positive atmosphere for learning as well as being an opportunity to get to know other team members (Aston, Shi, Bullôt, Galway, & Crisp, 2005). However, when teams do not get on well frustrations can become apparent and poor team cohesion can result. This is often the case with new IT systems are introduced thereby disrupting the workflow of the team (Noyes et al., 2016). Disruption in natural workflow that can lead to delays in the workday can cause significant strain on team cohesion due to a lack of trust and this can often be hard to reverse (Gross, 2016). Paradoxically when IT systems are implemented without incidence, when users have been given adequate training and when the system is perceived to be of use this can strengthen the connection between members leading to a more positive working atmosphere (Cucciniello, Lapsley, Nasi, & Pagliari, 2015).

2.5 Workflow

Understanding the practice and workflow of healthcare delivery gives an important advantage in the planning of health information systems (Reddy, McDonald, Pratt, & Shabot, 2005). IT developers and managers may have good intentions when undertaking the development of new systems but these may not always translate to effective, useful and more importantly accepted systems. Authors have sought to define the term and to study its effect in clinical setting as a means of offering better solutions to those tasked with developing and implementing HIT.

In a review of the literature Unertl et al found that authors have been unable to agree on a comprehensive definition for concept of workflow (KM. Unertl, Novak, Johnson, & Lorenzi, 2010). Far from being a negative they view this as a good opportunity for further cross disciplinary research to be carried out. Further research on the subject may offer fresh perspectives and can help to broaden the understanding of the clinical setting for those who do not have a background in the field. In the meantime however a working understanding of the term is being utilised to aid in the development of HIT.

Workflow can be viewed as the passing of 'tasks or documentation from one participant to another for enactment' (Gooch & Roudsari, 2011). Here Gooch describes the business setting in which processes are automated and applications are used to carry out tasks and are then passed forward. This 'flow' can also be applied in the clinical setting, as the principal is not dissimilar. In this case tasks are related to the patients care and the course it follows, but with the added

element of human interaction in relation to the interaction of care providers (Niazkhani, Pirnejad, & Berg, 2009). Figure 3 demonstrates a conceptual model for clinical workflow, demonstrating the key aspects of the flow of information which is coordinated between colleagues and monitored for gaps or breaches in the smooth flow of the information.

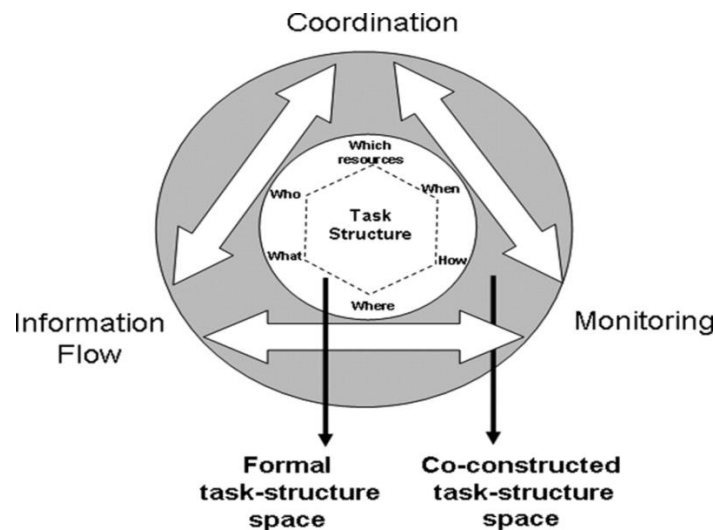


Figure 2-3: A conceptual model for clinical workflow, showing its different aspects and their relationship. (Niazkhani et al., 2009)

The purpose of defining and outlining clinical workflow is ultimately to gain a better understanding of work practices. From a clinical prospective, outlining workflow can allow the HCP to demonstrate their work domain to those who may not be familiar with the healthcare environment. Though a further benefit for HCP's in defining and demonstrating their workflow is that it can improve their own work practices thereby improving patient care and reducing errors (Chao et al., 2014). The benefit to the HIT developer is that they can gain a more complete appreciation of the complex, unpredictable clinical environment. This has been demonstrated previously by authors who have observed that for the successful implementation of health IT, developers must have a thorough understanding of the minute of the clinical context (Bowens, Frye, & Jones, 2010). In an attempt to better understand workflow in the clinical environment, authors have studied the interaction between members of clinical teams and new HIT systems. However, Unertl et al noted that these studies focused mainly on physicians and did not include all members of staff involved in the workflow process (K. Unertl, Weinger, Johnson, & Lorenzi, 2009). They conducted a mixed methods study which involved observing and interviewing a mixture of staff members in their daily work practice in an attempt to describe and model information and workflow. They previously observed that new IT systems can disrupt or change established practices and concluded that 'end users will create inefficient, but policy-compliant, workarounds to accomplish tasks when the HIT does not meet their needs' (K. Unertl et al., 2009). Clearly utilising workflow patterns is of benefit to all key stakeholders for improving

work practice. Developing systems that will accommodate changes in clinical work practice will ultimately improve uptake in use (Müller, Greiner, & Rahm, 2004).

Though some authors have welcomed the opportunity for further research to categorically define workflow, it would appear that this lack of an agreed definition has not hampered HCP's or HIT developers. Successful collaborations between healthcare and IT have resulted in well accepted IT systems and clinical decision support (CDS). Utilising established pathways have been found to support personalised patient care which allows for 'the complex decisions required for stratification and personalized treatment of patients and to keep up with the high rate of change in therapeutic options and knowledge' (Bucur et al., 2016).

It highlights the acceptance amongst HIT system developers of understanding the importance of clinical workflow and leveraging this in the introduction of systems that are flexible. They understand/ acknowledge the need for flexible systems such as the one designed by Bucur et al. While the continued study of workflow and the search to define it is also important to move forward with planning and implementing HIT systems. If workflows are defined by clinicians who use them, and this is appreciated (and the changeable nature of workflows) by HIT developers then this will surely create an environment to move forward in.

It would appear that institutions are largely defining their own workflow practices and definitions and using them according to what suits their own practice. This is not to say that they are developed ad hoc but are based on best practice guidelines and protocols. Each member of the team has a defined role which is assigned to them to contribute to the overall flow and delivery of care with the end result after each step is executed as per plan. Regular meetings eg MDT's allows for

2.6 Clinical Pathways

In recent years patient care has become more complex and protracted, often involving the input of several different healthcare professionals at the same time and often over lengthy periods. As disease processes have become more complex it has become important to develop roadmaps to guide the progression of care (Trebble, Hansi, Hydes, Smith, & Baker, 2010). To aid in this, clinical pathways have been developed and are being used with increasing regularity. An important driver of these pathways has been the need for constant improvements in patient safety coupled with rising demand on resources (Gopalakrishna, Langendam, Scholten, Bossuyt, & Leeflang, 2016). Other influences are the need to contain the increasing cost of care as well as to promote the use of evidence based practice (Jackman et al., 2017).

Pathways can essentially be described as a set of defined steps for healthcare professionals to follow when planning, implementing and evaluating patient care. Kreys and Koeller define pathways as a 'structured multidisciplinary care plans that explicitly articulate the essential steps in treating specific clinical problems' (Kreys & Koeller, 2013). They allow for the structured, defined treatment and management of the patient over a specific period of time using evidence based data (Kinsman et al., 2010). The purpose of a pathway as defined above is to organise the care of the patient from a specific time point e.g. diagnosis through to a defined endpoint. The pathway should guide the HCP through the various steps of treatment, from diagnosis to the time the patient is discharged.

As a clinical tool pathways have become central to many areas of healthcare provision and are used frequently in cancer care (Messenger et al., 2016). They can be developed and applied to a specific, stand-alone clinical problem or they may be applied to more complex processes that overlap. Moreover, several pathways can interact at one time, for example post-operative patient management and analgesia administration. Furthermore, they can easily be changed and updated with the discovery of new research and as a result have been seen as a very useful tool for HCP's in their continuing practice development. Many authors have found that because of this a positive learning environment is established, giving rise to discussion and debate of new evidence (Deneckere et al., 2012). However, it appears that earlier attempts to introduce pathways were not met with such a favourable response. In 2005 Hindle and Yazbeck reviewed the literature examining attitudes to pathways in 17 European countries they cited clinicians fearing a loss of autonomy in decision making as being a major stumbling block to their introduction (Hindle & Yazbeck, 2005). Reassuringly though, they found evidence of cost savings, reduction in procedure time and evidence that patients were more likely to complete a course of treatment when on a pathway (Hindle & Yazbeck, 2005). These findings serve perhaps to highlight the change in attitude over a short space of time by clinicians to the necessary role of pathways in unifying practice amongst HCA's. It can be argued that the very principle of clinical pathways is to ensure that patient care is consistent and supports evidence based practice, regardless of an individual's view point. However, Zon et al sound a note of caution in regard to pathways and their overuse; they found that there was increasing concern amongst oncology HCPs' in relation to the way they were being developed in regard to 'quality of care, and transparency in the weighing of information on clinical outcomes, toxicities, and costs in final pathway development' (Zon et al., 2016). In an attempt to calm the fears of concerned colleagues the American Society of Clinical oncology developed guidelines and recommendations for the development of high quality clinical pathways in order to support and encourage there continuing use (Zon et al., 2016).

Despite concerns by some in relation to the overuse of pathways, the push to increase uptake of electronic patient records has necessitated that they be developed for electronic usage. The development of computer-interpretable guidelines (CIG) has become an important factor for the move towards more effective clinical decision support systems and personalised patient treatment (M. Peleg et al., 2003). Authors have demonstrated that by using guidelines developed by clinical experts in the field, CIG's can be developed that direct and teach less experienced clinicians (González-Ferrer, Valcárcel, Cuesta, Cháfer, & Runkle, 2017). Far from taking autonomy from physicians, guidelines and CDSS can help to instruct those who may not be familiar with a specific specialised area. Ultimately the aim is to improve patient safety by reducing the potential for clinical errors (Mor Peleg, 2013).

2.7 Patient Safety

The concept of patient safety extends beyond causing physical harm, for example in form of medication error (Ulrich & Kear, 2014). Harm to patients can also come in the form of potential risk, and near miss events. Human error has been identified as one of the major causes of harm to patients and may be higher than previously thought (Classen, 2011). IT solutions have been touted as a way of reducing errors and improving patient safety. However, ongoing problems with HIT systems, a lack of acceptance in systems and the potential for workarounds has meant that challenges have still to be overcome before this claim can be substantiated. Further to this, in recent years with the proliferation of health IT, authorities have become cognisant of the need to protect patients' data from cyber-attack and ransomware necessitating a new approach to patient safety. Challenges abound for both healthcare and information technology specialists and if anything these new challenges highlight the increasing need for both sides to work more closely together (Boaden & Joyce, 2006).

One of the most notable articles in recent years in relation to patient safety detailed alarming evidence of in relation to the harm and potential harm caused by medical error (Kohn, Corrigan, & Donaldson, 2000). This may be in part due to increasing pressures on HCP's due to staff shortages and the increasing complexity of patients' healthcare problems as a result of aging populations. Yet, as Banihashemi et al found that the majority of medical errors are not due to individuals but are in fact due to the complicate nature of the healthcare system (Banihashemi et al., 2015). Authors have noted that there is often a risk to patients' safety during the implementation of new HI systems but that flaws in new systems may only become apparent after they have been deployed (Ash, Berg, & Coiera, 2004). Examples of notable events that resulted in actual or potential harm from IT systems were, automatic system cancelation of orders and appointments, patients' results being sent to the incorrect doctor, results being

assigned to the wrong patient, delay in urgent appointment when 'a new IT system was poorly integrated with clinical workflow' (Farah Magrabi et al., 2015). IT downtime, virus attack and inadequate storage of data have been listed as causing further delays in access to patient data thereby delaying clinicians and interrupting workflow. Black et al found that there was a considerable gap in the proven data that supports the theory that HIT is of benefit and helps prevent patient safety incidents (Black et al., 2011). And Magrabi et al concur with the view that IT systems increase the number dangerous events that can lead to harm being caused to patients and further suggest that addressing this issue should be a priority for 'all major IT implementations' (Farah Magrabi et al., 2015).

Much has been written about the need to adopt and implement HIT systems, and about the need for HCP and health institutions to embrace the benefits of such systems but it is imperative that these systems are fit for purpose and are not just accepted and adopted due to pressure. It has been noted previously that HCP have been reluctant to adopt these systems fearing loss of autonomy in relation to decision making in regard to patient care. Health IT programmes such as clinical decision support systems (CDSS) must not only be fit for purpose to support clinicians but must be developed to provide support that is appropriate, accurate and up to date (Wright et al., 2015). Touted as the panacea of health IT, often times poorly developed CDS systems or ones that are out dated have resulted in patient near or actual harm and added to HCP mistrust of systems (A. Miller et al., 2015). Trying to find the balance between the potentially positive impact of HIT and allaying the fears of HCP is a topic examined by authors worldwide. The rush to introduce HIT should not result in a lack of risk assessment of systems. Overcoming these misgivings can ultimately help to create better adoption rates but at what cost? Understandably patient safety is at the core of many HCP's concerns in regard to new IT systems (Catwell & Sheikh, 2009). What may appear as a lack of trust in new systems or an unwillingness to change old work practices is in fact often rooted in genuine concern for patient safety (Black et al., 2011). Undoubtedly the challenge of meeting the demand for excellence in HIT while providing systems are safe and beneficial is considerable. However, if there are up to date, robust protocols and guidelines that support evidence practice in place these can add to harm prevention methods. The need for constant and stringent evaluation of these systems has been offered as a solution to help prevent ongoing errors (Blumenthal & Tavenner, 2010).

Using data retrieved from reports submitted to the FDA in relation to errors caused through the use of HI systems, Magrabi et al were able to classify known errors and identify new ones (F. Magrabi, Ong, Runciman, & Coiera, 2012). In a later work by this group they were able to add to the list of problems caused by IT systems and human error- Figure_ demonstrates this classification system. This serves as a good example of the need for constant study and

evaluation of IT systems. The continued introduction of HIT is inevitable and it is hoped that lessons learned from previous errors will only improve things going forward. The literature reviewed has highlighted that there is a need for continuous, rigorous, independent and ongoing assessment of systems (Black et al., 2011). Patient safety is constantly at the centre of HCP's work, by training technically knowledgeable staff with a clinical focus that can look for and recognise potential errors in systems there is greater potential for improving patient safety (Russo, Sittig, Murphy, & Singh, 2016).

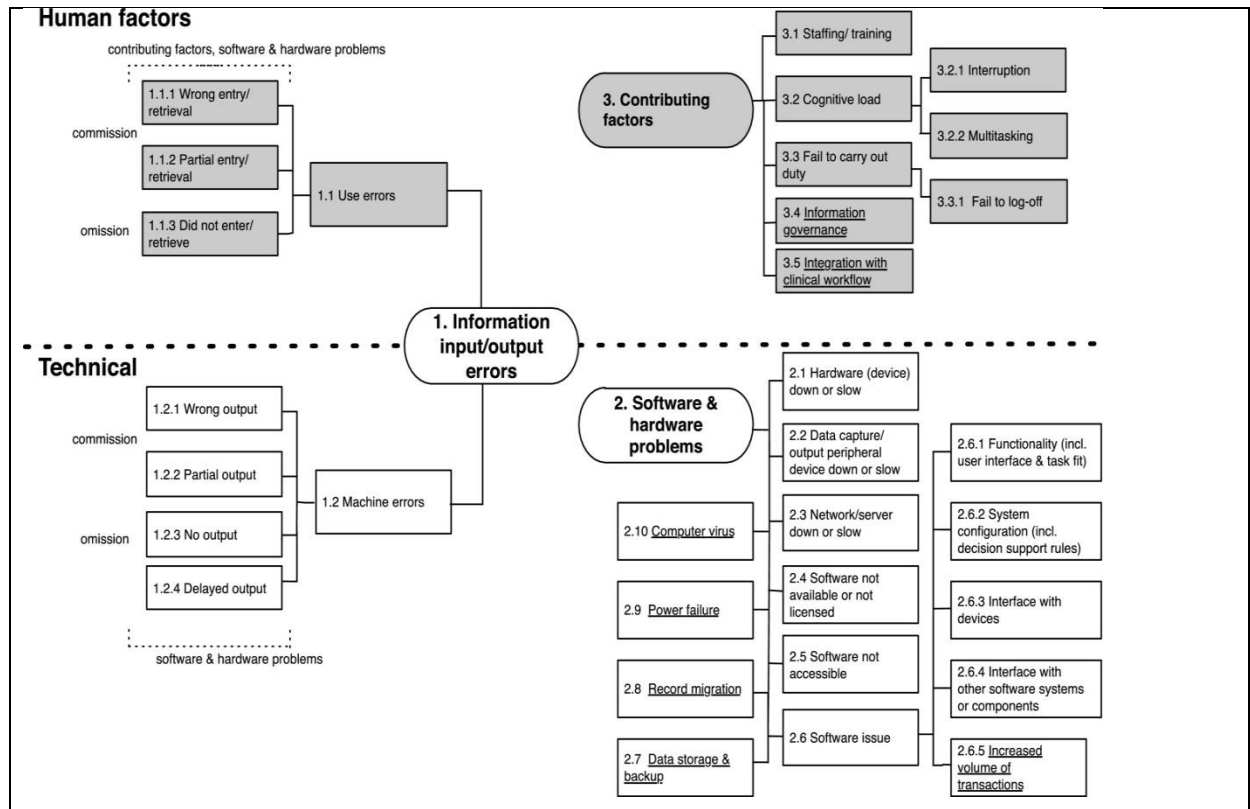


Figure 2-4: Classification for problems involving IT, new categories are underlined. From Magrabi et al 2012

Though there is undoubtedly potential for large scale errors with HIT systems as previously noted, one of the benefits includes detecting diagnostic errors (Singh et al., 2010). Alert systems can provide timely support to clinicians in relation to drug interaction or inappropriate ordering of examinations (R. A. Miller et al., 2005). When HI systems are integrated correctly, adequate training is provided and users have confidence in a system authors have found that benefits follow. Patient details are concentrated in one area and are available easily to several HCP at one time. IT systems allow for audit to be carried out more easily and for errors to potentially be identified sooner (De Wet & Bowie, 2011). Though data has shown that medical errors and potential harm to patients may be higher the originally thought there is potential to improve matters as systems develop and more is learned from previous experiences.

As patient numbers and life expectancy increases, efforts must be made to improve safety but also to extract the benefits from HIT. As the number of new systems increase in the clinical setting it is inevitable that users will become more accustomed to their presence. Meaningful use and interaction can improve outcomes as lessons are learned from previous mistakes (Stimson & Botruff, 2017). Being mindful of potential errors that can occur, HCP and IT professionals can work together to improve patient and systems safety. Authors have listed the myriad of potential errors that have and can occur but lessons have undoubtedly been learned and can be used beneficially going forward (Black et al., 2011).

2.8 Conclusion

In recent years cancer care has developed to become a more formulated structured process. The process of understanding and formulating workflows, developing constructed pathways and providing evidence based practice have become vital to the care of the cancer patient. Ultimately these elements complement the teamwork and coordination of the multidisciplinary team and have become important features in the journey of the cancer patient.

Chapter 3

Methodology

3.1 Introduction

This chapter outlines the research question, the methods used to carry out the research as well as the justification of the research method chosen. The common research methodologies are discussed and the rationale for the use of the chosen method is given. The approach to data collection is outlined as well as an explanation of why this method was used. It is hoped that the collection of this data will open a dialogue on the usage of EPR's in the Irish setting.

3.2 Research Question

As previously outlined, the research question purposes to address the themes of how a melanoma service utilises an EPR. *Arising* from this, the questions of structure of workflow, communication methods and patient safety arise. The question of workflow through the EPR is further examined by posing the following extended questions-

1. Is there a current structured workflow or care pathway for patients diagnosed with malignant melanoma?
2. Is there optimal communication among multidisciplinary teams involved in the care of patients with malignant melanoma?
3. Are there any identifiable ways in which patient safety could potentially be impacted through current use of an EPR?

3.3 Study aim and objectives

The aim of the researcher is to add to the discussion regarding the use of EPR's in the Irish setting. This is not meant to be a definitive work on the topic but merely to enhance the debate on the subject and to be used as a comparison to international findings. This researcher hopes to provide relevant and potentially valuable results that will add to the existing knowledge base and may lead to further discussion on the topic.

3.4 Research Setting

The setting for this research is a large busy public hospital, located in the centre of Dublin city. There is a main hospital building housing wards, operating theatres and outpatient departments.

The campus also has some older buildings one of which houses the Department of Dermatology. Patients are seen and procedures are carried out in both locations. Each patient who attends is issued with a medical record number and is entered onto the EPR. Radiology and laboratory systems are integrated and this information is available through the EPR, which also allows for order entry. The choice of setting is incidental to research as it is the only public hospital with an EPR which has been in place for a number of years.

3.5 Participants and recruitment

As previously noted, earlier studies were principally aimed only at evaluating at how medics used EPR's in their practice (Gagnon et al., 2014). However, the multidisciplinary team is a diverse unit made up of several team members all of whom are involved in the patient journey and play an important role in process. Therefore this researcher was interested in exploring their contribution to the process in an effort to compile a more understanding of the MDT use of an EPR.

Study participants were recruited from any team member who is involved in the melanoma pathway process. Potential participants were identified from the MDT meeting list and from the hospital staff team listing. Clinical staff, administration and 'others' were invited to complete the online questionnaire. A total of 28 team members were identified as being eligible to take part in the study. Table 3-1 lists the team members from various areas who were identified as eligible to participate in the study

TABLE 3- 1: MELANOMA PATHWAY TEAM MEMBERS

CLINICAL	ADMINISTRATION	OTHER
PLASTIC SURGEONS	OPD SECRETARIES	DATA MANAGER
DERMATOLOGISTS	PLASTIC SURGERY SECRETARIES	MDT COORDINATORS
HISTOPATHOLOGISTS	DERMATOLOGY SECRETARIES	LABORATORY SCIENTISTS
RADIOTHERAPIST		
ONCOLOGIST		
NCHD'S		
NURSES		

Initially an email was sent to potential recruits. The email contained an introduction to the researcher, a brief description of the study and an invitation to participate by clicking on a link contained in the email. Initial response was favourable but low and faltered after day two. And so, with the permission of the lead consultant the researcher attended the melanoma MDT to advertise the study and to introduce herself. This also allowed the researcher to collect alternate email addresses as some members of staff did not use their hospital email account. Following the MDT meeting another email was sent and any new email addresses were added to the listing. Again a spike in response was noted but again tapered off. Finally, another email reminder was sent to remind potential participants which again resulted in a moderate response rate. After these recruitment attempts the researcher felt that it would not be appropriate to contact potential participants.

3.6 Literature review

A comprehensive literature search was undertaken to identify up-to-date literature available on topics identified as relevant to this dissertation. In undertaking this literature review the author was conscious of some differences in the interpretation of certain terms as well as a variation in definitions. The researcher was conscious to keep this in mind while entering terms into the various search engines. At times this informed the search and led to on other articles that were appropriate to the topics being searched. A list of the primary and secondary search terms used in the search used are outlined in table 3- 3 below.

Peer reviewed articles from 2000 to present were searched for. Articles that were published before the year 2000 were excluded except in cases where the researcher felt them to be relevant in an historical context. The primary search was carried out through the Trinity College library and was done remotely and electronically. Table 3- 2 outlines the sources of information accessed to compile the articles included in this literature review and to inform and support the overall dissertation. Relevant articles were identified and downloaded to the EndNote bibliography software system to electronically manage the articles collected. There was found to be a myriad of articles about the chosen areas listed below but no articles specifically dealing with EPR use in the Irish setting. Therefore the researcher was guided by research and experience reported in the international setting. Though this experience lends to the general knowledge in the field and hopefully provides and valuable from which to examine the field being studied.

TABLE 3- 2: LITERATURE REVIEW DATA AND INFORMATION SOURCES

DATABASES	WEBSITES	OTHER SOURCES
PUBMED	HSE	YOUTUBE
GOOGLE SCHOLAR	NICE	NEWSPAPERS- THE EXAMINER
COCHRANE LIBRARY	NCRI	GOOGLE
SCIENCE DIRECT	HIQA	UNPUBLISHED DISSERTATIONS
JSTOR	NCCN	ARTICLE REFERENCE LISTS

TABLE 3- 3: LITERATURE REVIEW TERMS USED

PRIMARY SEARCH TERMS	SECONDARY SEARCH TERMS
MELANOMA	SKIN CANCER, CUTANEOUS MELANOMA, SKIN CANCER GUIDELINES, OCCURRENCE, PREVENTION, DIAGNOSIS AND MANAGEMENT
ELECTRONIC PATIENT RECORD	ELECTRONIC MEDICAL RECORD, ELECTRONIC HEALTH RECORD
CLINICAL PATHWAYS	MELANOMA PATHWAYS, ONCOLOGY PATHWAYS
MULTIDISCIPLINARY TEAM	TEAM WORK, COMMUNICATION
PATIENT SAFETY	GUIDELINES, RECOMMENDATIONS, PATIENT SAFETY AND HIT
WORKFLOW	CLINICAL WORKFLOW, MELANOMA WORKFLOW,

3.6 Research Methods

When choosing an appropriate methodology the researcher must be aware of the various methodologies available (Bryman & Bell, 2007). Once a topic has been chosen the researcher commits to a set of ideas that guide their view of how the research will be undertaken. This is more commonly known as the paradigm. A paradigm is broadly understood to be a set of ideas and beliefs that guide the researcher through how and why the research is undertaken and how the results are interpreted (Parahoo, 2006). Though the researcher may not be aware of the influence of a set of beliefs and assumptions guiding them, a paradigm acts as an organisational framework (Curtis & Drennan, 2013). Different disciplines have guiding opinions and theories that direct and contribute to their own professional input to research (Weaver, 2006). This will inevitably guide and influence researchers from various backgrounds.

Many researchers can often favour one type of research method only. However, Bryman warns against this in what he describes as the 'ghettoisation' of certain methods and encourages researchers to be open to the benefits other methodologies (Bryman & Bell, 2007). In this regard a thorough understanding of the various methods is useful not only for choosing an appropriate method but to understand what approach may be used in future studies. Before choosing a research methodology this researcher contemplated using one of the three common methods Quantitative, Qualitative and Mixed methods. The most accepted methods in research are Quantitative and Qualitative and more recently research that combines elements of both of these, the Mixed Methods approach has become more popular and has been referred to as the 'third methodological movement' after the more traditional methods of qualitative and quantitative (Ingham-Broomfield, 2016). Barnham suggests that Quantitative research uses a 'what' approach Qualitative uses a 'why' and a mixed methods approach uses both (Barnham, 2015). The qualitative research paradigm draws on the an ethnographic, phenomenological and grounded theory approach to data collection (Polit & Beck, 2006). These approaches rely on data collection taking place in an environment natural to the subject, allowing for the study of the lived experience and concentrating on how the individual experiences their surroundings. Researchers use this method to form a more holistic understanding of human behaviour, by capturing the opinions and beliefs of individuals and forming a hypothesis (Grove, Gray, & Burns, 2015). For some researchers the benefits of this approach is that it allows for a less structured environment in which to collect data, this they argue ultimately provides for a more complete understanding of the subject being studied (Javalgi, Granot, & Brashear Alejandro, 2011). To achieve this some of the following methods of data collection are used, face to face interviews, observation of conversations and interactions between groups and individuals and as well as personal, reflective diaries capturing the feelings and experiences of the subject. It has been argued that these methods allow the researcher to gain a more holistic understanding of their subject matter but others find this form of enquiry over ambiguous (Polit & Beck, 2006). The 'what' of the quantitative method, relies on a more structured approach to data collection such as utilising questionnaires and undertaking a more controlled approach to data collection (Parahoo, 2006). This formal, structured approach to data collection is too prescribed for some researchers and does not uniquely capture the voice of the individual subject or reflect the environment being studied (Creswell, 2014). And so for some, the growing popularity of a mixed method approach offers the solution by allowing the research to use the more structured quantitative approach coupled with the less structured qualitative method (Bryman, 2012). A mixed methods approach has been offered as a harmonious common ground to what some researcher view as the hardnosed approach of quantitative methods and others view as the overly relaxed approach of qualitative methods (Venkatesh, Brown, & Bala, 2013).

3.6.1 Quantitative Research method

A quantitative research approach was felt to be the most appropriate method of data collection for this study. As previously outlined both the qualitative and mixed methods approach involve interaction with study subjects. In a situation where the subjects are known to the researcher, the question of bias comes to the fore (Lobiondo-Wood & Haber, 2010). The researcher is reliant on their own skills to ensure that they are not influenced by their knowledge of the subject or surroundings, however with a quantitative the researcher is not under such a burden (Parahoo, 2006). As this researcher is known to many of the participants it was felt that respondents would be freer to answer questions without feeling an obligation either to respond in a certain way or the need to participate in the study. Furthermore this study examines how the participants use the EPR in relation to the melanoma pathway so their thoughts and feelings were not being sought.

The very nature of a quantitative research approach necessitates that in its most basic form it collects measurable data (Bryman & Bell, 2007). Quantitative research has been described as 'is a formal, objective, systematic process in which numerical data are used to obtain information about the world' (Burns & Grove, 2008). As the researcher takes an objective approach to the structured data collection they can be objective, allowing for an unbiased approach and producing reliable and validity tested data (Park & Park, 2016). Questions are posed that will elicit responses which are analysed statistically and that produces numerical data in a non-interventional manner. Variables are tested using an instrument and the results are analysed to produce a numerical report. Though qualitative and mixed methods also measure human phenomena the quantitative approach applies methods that predicts outcomes, categorizes and organises human behaviour into measurable units and 'examines possible impact or consequences on designated outcomes' (Parahoo, 2006). The paradigm from which the quantitative approach arises is based on a philosophical model that asserts that 'human phenomena is amenable to objective study, in particular to measurement' (Parahoo, 2006). Founded in the positivist ideology, this approach believes that the natural sciences can measure only what can be seen and therefore the results can be regarded as facts (LoBiondo-Wood & Haber, 2014). As Bowling points out 'positivists are not concerned with measuring the meaning of situations to people because they cannot be measured in a scientific and objective manner' (Bowling, 2009). For some researchers this approach is too unfeeling and the lack of personal input from the subjects diminishes research findings. However, as others point out, one of the advantages of this approach to research and data collection is that it acts as a solid foundation from which to build further studies (Gerrish & Lathlean, 2015). This researcher concurs with

this viewpoint and as stated earlier aims to offer the findings of this study as a baseline from which to expand into further studies.

Quantitative research commonly uses a deductive process to formulate a theory then to collect data to produce quantified descriptive findings (Curtis & Drennan, 2013). In this study a descriptive approach was taken to the research in order to 'observe, describe and document aspect of a situation as it naturally occurs' (Polit & Tatano Beck, 2017).

3.6.2 Research Design

Research design can be considered a process map, providing a definite direction by which the researcher is guided through the research study (Creswell, 2014). Figure 6 depicts the steps in the process of a quantitative study which the researcher will follow. This research study uses two common quantitative researches approaches descriptive and exploratory. Descriptive design has been defined as a method that 'seeks to describe the current status of an identified variable or phenomenon' (Rhodes, 2015). Essentially, 'the purpose of descriptive research is to name things, or phenomena, or to classify characteristics of things'. As the nature of this research is to understand how team members use an EPR, an exploratory approach to the research design was taken.

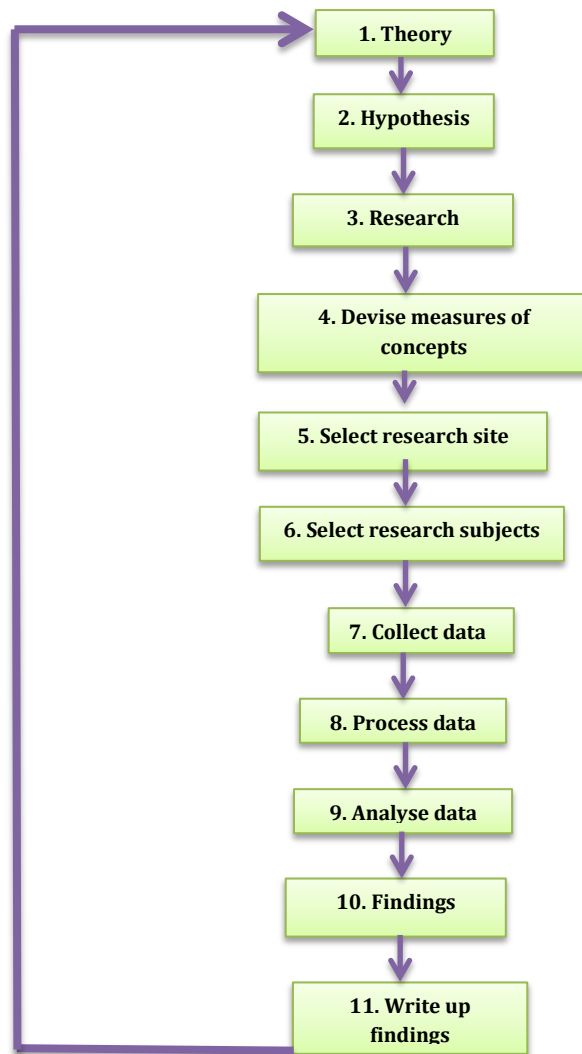


Figure 3-1: The process of quantitative research. Bryman 2012

3.7 Data collection method

The aim of this study is to try to gain a better understanding of how members of a multidisciplinary team utilise an electronic patient record (EPR). As this researcher is known to many of the target population having previously worked in dermatology, it was felt that an anonymised online questionnaire would be best suited to collect the required data. Previously authors have reported positive results with this method in relation to response rates when online questionnaires are used (Bray, Noble, Robinson, Molloy, & Tilling, 2017).

Conscious of the limitations in this setting of using either a qualitative or mixed methods approach it was also hoped that an anonymous questionnaire, where the respondents could not be identified would garner a greater response rate.

3.7.1 Questionnaire

Following the compilation of the questions the questionnaire was sent to a consultant dermatologist and 2 nurses who had previously worked in the service and had experience of using the EPR. They assessed the questions for relevance and suitability. Suggestions were made and changes to the questions were made where appropriate.

3.7.2 Questionnaire development

As no appropriate questionnaire was found that addressed the specific questions that were being asked, a questionnaire was developed. Questions were composed that were pertinent to the research field. These questions were administered to those persons identified previously and amendments were made where appropriate.

3.8 Ethical considerations

An ethics application was made to the hospital in question however as this research was peer to peer it did not require assessment by the hospital ethics committee (Appendix E). Following this an application was made to the ethics committee in Trinity College Dublin and was granted following the requested amendments (Appendix D).

3.9 Data analysis

Completed questions were entered into an excel spread-sheet, percentage rates were calculated and representative charts and diagrams were produced to demonstrate findings.

3.10 Conclusion

This chapter outlined the research question and provided a justification for the type of research method that was used. The two other main methods were also explored and an explanation was provided for not opting to take either of these approaches. The use of the type of questionnaire and its development was provided as well as an explanation of the smaller sample size used. Ultimately it is hoped that this research will act as platform for further studies.

Chapter 4

Results

4.0 Introduction

This chapter will present the results of the questionnaire which was completed by respondents. The purpose of this is to answer the research question and support or disprove the hypothesis that the EPR is used by all members of the MDT for the melanoma patient pathway. Response rates are provided and questionnaire answers are discussed.

4.1 Response rates

28 members of the melanoma MDT were identified as being eligible to participate in the study. Potential participants were initially contacted by email and a link to the study questionnaire was provided in the contact email. The response rate on the first day of was promising but no further responses were received after this initial contact. The researcher then attended an MDT meeting to present the study and followed this up with another email. Again the response rate was favourable but dropped off following this second contact. A final email reminder was sent and further responses were received resulting in the final response rate of 21 out of a potential of 28 participants, thus producing a 75% average response rate. The results of questionnaire response rates are presented in table 4-1.

4.1.1 Respondents

Of the 21 respondents the majority identified as being from the Medical/ Surgical group. Members of this group had been identified by the researcher as medical doctors i.e. dermatologists, surgeons and nurses. The next largest group of responders were in the administration group of which there were 5 and finally 3 people identified as being in the 'other' group which included data managers, MDT coordinators and laboratory scientists.

Figure 4-1: Participants Role

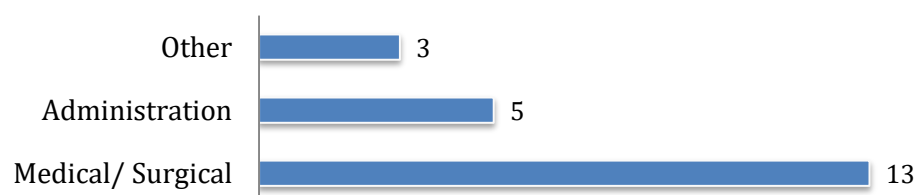


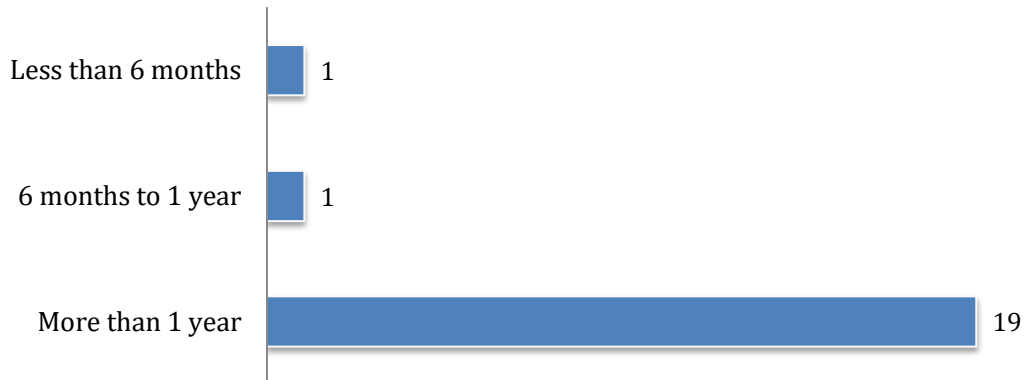
Table 4- 2: Response level

QUESTION NUMBER	QUESTION	NUMBER OF RESPONSES	RESPONSE RATE (%)
INTRODUCTION	Please indicate your role	21	75%
Q.1	How long have you been using the current Electronic Patient Record (EPR)?	21	75%
Q.2	Do you have previous experience of working with electronic patient records?	21	75%
Q.3	Do you find the current electronic patient pathway easy to use?	21	75%
Q.4	Do you feel that the training you received for this EPR was adequate?	21	75%
Q.5	Are you aware of where to avail of EPR training?	21	75%
Q.6	In relation to the melanoma patient pathway approximately how much of your work is carried out through the electronic patient record?	20	71.4%
Q.7	Can you access all of the information that shows the patient pathway through: a) the EPR	21	75%
Q.8	Can you access all of the information that shows the patient pathway through: b) the patient notes	21	75%
Q.9	When you have been involved in steps in the patient pathway do you record these: a) In the EPR	20	71.4%
Q.10	When you have been involved in steps in the patient pathway do you record these: b) In the patient notes	20	71.4%
Q.11	Is the information about the patient pathway user friendly? a) In the EPR?	20	71.4%
Q.12	Is the information about the patient pathway user friendly? b) In the patient notes?	19	67.8%
Q.13	Does the EPR guide you along the expected patient pathway?	20	71.4%
Q.14	Do you communicate with other members of the multidisciplinary team through the EPR?	21	75%
Q.15	Do you use this method to communicate requests to action a follow on step in the melanoma patient journey with other members of the team?	21	75%
Q.16	Does the EPR alert you if steps along pathway are not achieved?	18	64.2%
Q.17	Do the patient notes alert you if steps along pathway are not achieved?	20	71.4%
Q.18	Are you aware when the next step has been actioned/ completed?	20	71.4%
Q.19	The EPR captures all aspects of the melanoma patient pathway	18	64.2%
Q.20	The patient notes captures all aspects of the melanoma patient pathway	18	64.2%
Q21	For the melanoma patient pathway would prefer to use-	19	67.8%

4.2 EPR: use and experience

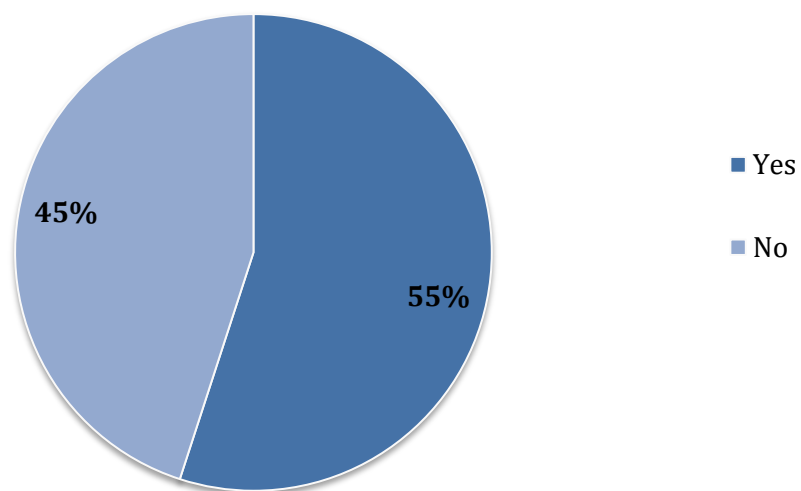
Respondents' current and previous experience of EPR use was established in questions 1 and 2. The majority of MDT members had more than one years' experience using the current EPR, while only 2 team members had used the system for less than one year.

Figure 4-2: Length of time using current EPR



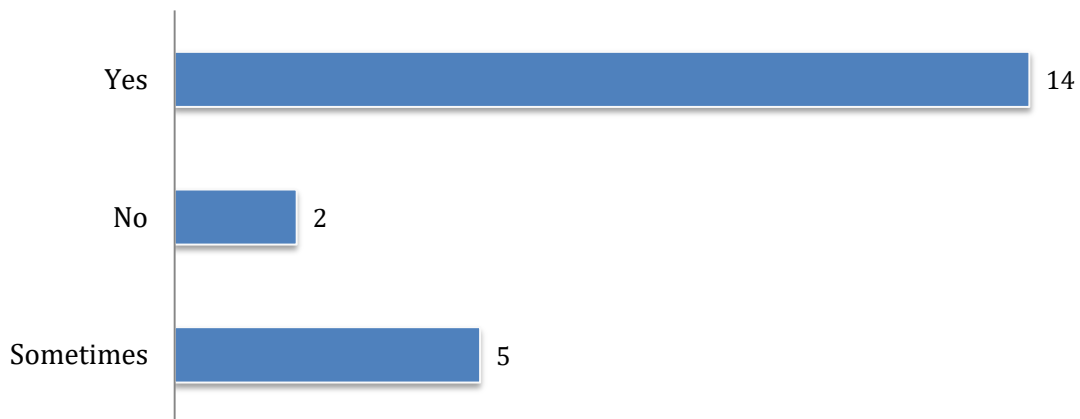
Question 2 established if users had previous experience of working with EPR's. 55% of team members reported having had previous experience with EPR's while 45% answered that they did not. The total number of answers was 20, with 11 team members answering yes and 9 answering no as shown in the pie chart below.

Figure 4-3: Pervious experience of using EPR's



Finally question 3 established if respondents found the EPR easy to use. The total number of answers was 21 and the majority of team members reported finding the EPR easy to use. 14 answered yes while 5 found it easy to use sometimes and 2 team members answered no, that they did not find it easy to use.

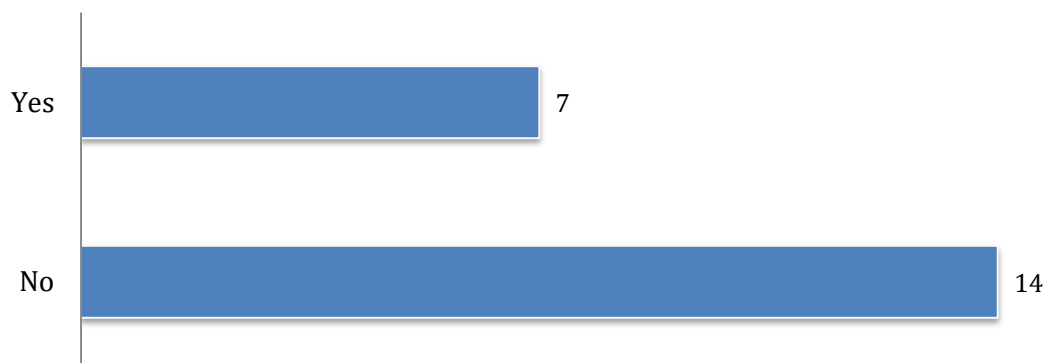
Figure 4-4: Ease of use of current EPR



4.3 EPR training

Questions 4 and 5 dealt with EPR training on the current system. In question 4 respondents were asked if they the training they received on the current system was adequate. Figure 4-5 shows the responses to the question outlining that 67% or 14 MDT members found it to be inadequate, whereas only 33% or 7 respondents found it to be satisfactory.

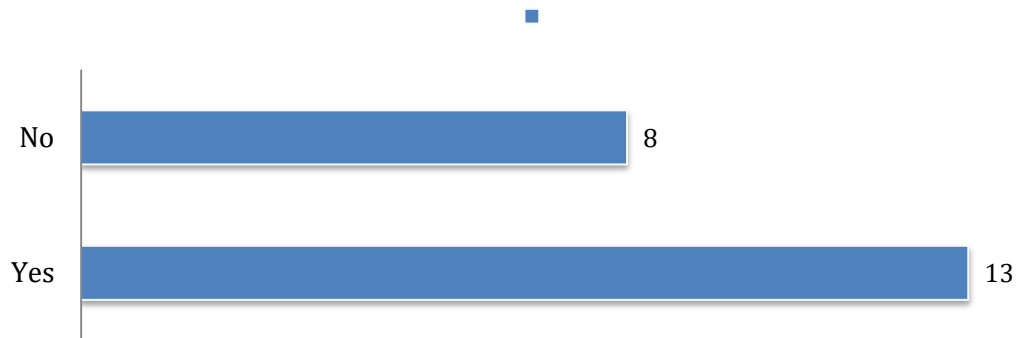
Figure 4-5: Was EPR training adequate?



In question 5 participants were asked if they aware of where they could avail of training on the EPR. 21 team members replied with 62% or 13 MDT members answering that they were aware

of where they could access EPR training. 8 team members or 38% of respondents were unaware of where training could be accessed.

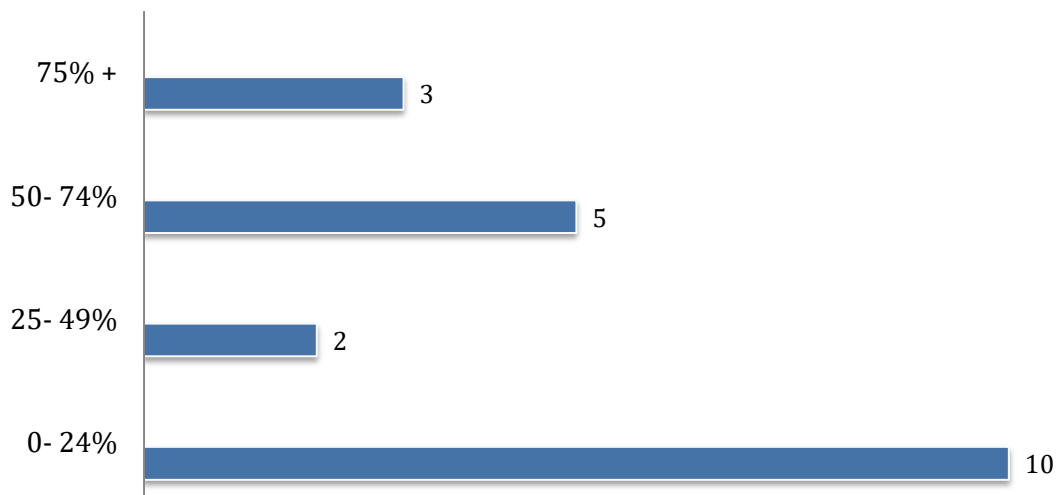
Figure 4-6: Are you aware of where to avail of EPR training



4.4 The melanoma pathway and the EPR

Question 6 assessed how much of the team members work, involving the melanoma pathway was carried out through the EPR. 20 team members answered this question, with 50% or 3 respondents answering that 75% plus involved the EPR. The majority of the MDT respondents, 10 members answered that 0- 24% of their work for the melanoma pathway was carried out through the EPR. 2 team members found that 25- 49% of their work was through the EPR and 5 team members answered that 50- 74% was carried out through the electronic patient record.

Figure 4-7: Amount of melanoma work carried out through the EPR



4.5 The patient pathway and information access

Questions 7 and 8 ascertain if relevant information was accessible through the EPR and the patient chart respectively. Figure 4-8 shows the responses in relation to access through the EPR and figure 4-9 shows the responses in relation to access through the patient chart. Though 33% of team members found information accessible through the EPR, 43% or 9 team members did not find the information accessible. 4 team members or 19% were sometimes able to access the data and 5% or 1 member of the MDT was unable to access information through the EPR.

Figure 4-8: Is patient data accessible through the EPR

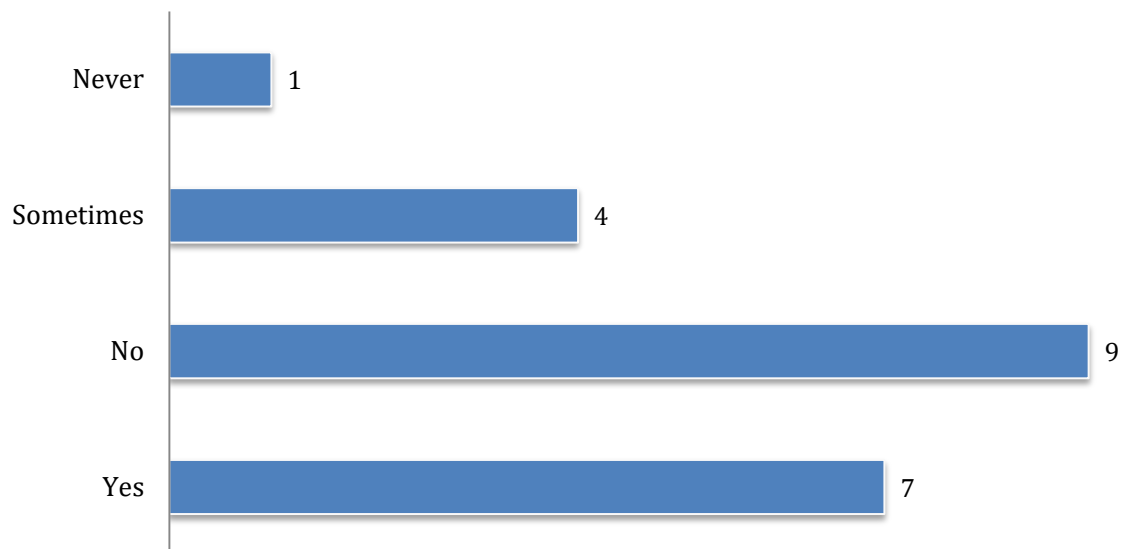


Figure 4-9 shows the responses of team members in relation to accessing data through the patient chart. A total of 21 responses were received with the majority of respondents answering that they were unable to access information in the patients chart. 11 team members or 52% reported not being able to access information for the patient pathway through the patient chart. 6 team members or 29% were sometimes able to access the information while 14% or 3 team members could access the information through the patient chart.

Figure 4-9: Is patient data accessible through the patient chart

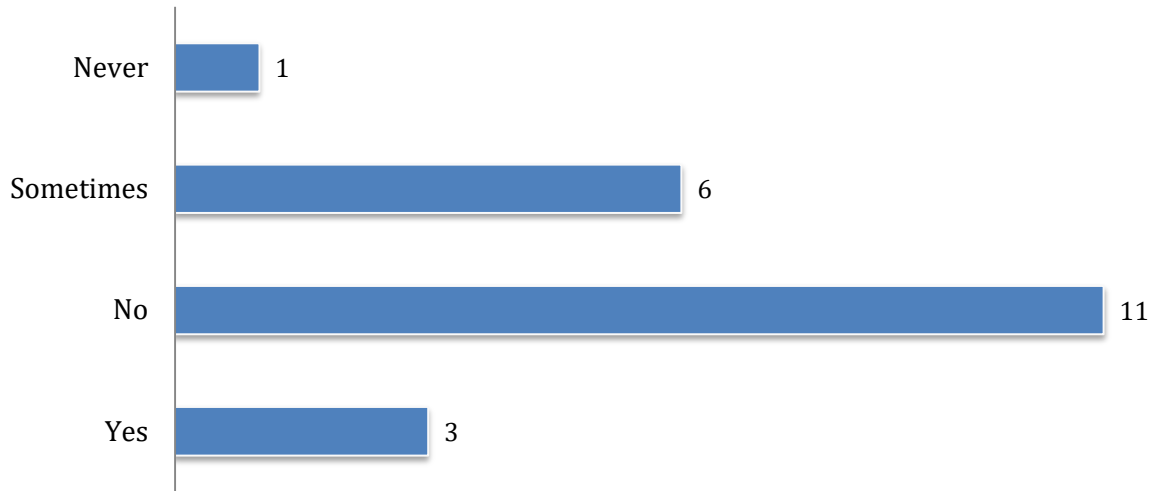
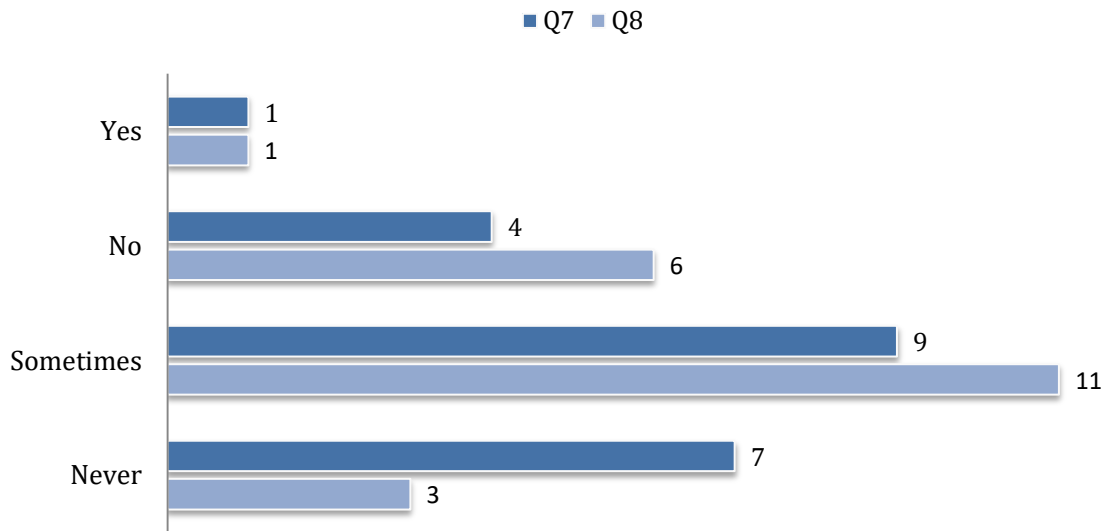


Figure 4-10 below shows the combined answers of question 7 and 8 contrasting the answers of the respondents in relation to accessing information from the EPR and the patient notes.

Figure 4- 10: Combined answers from question 7 and 8



4.6 Recording patient pathway information

Questions 9 and 10 address the topic of recording information accumulated from the patient pathway. A total of 20 replies were received for both answers providing an overall response rate of 71.4%. When asked if respondents recoded patient pathway steps in the EPR 30% or 6 team members all answered Yes, No and Sometimes while 10% or 2 respondents answered never. Results are displayed in figure 4-11.

Figure 4-11: Recording pathway steps in the EPR

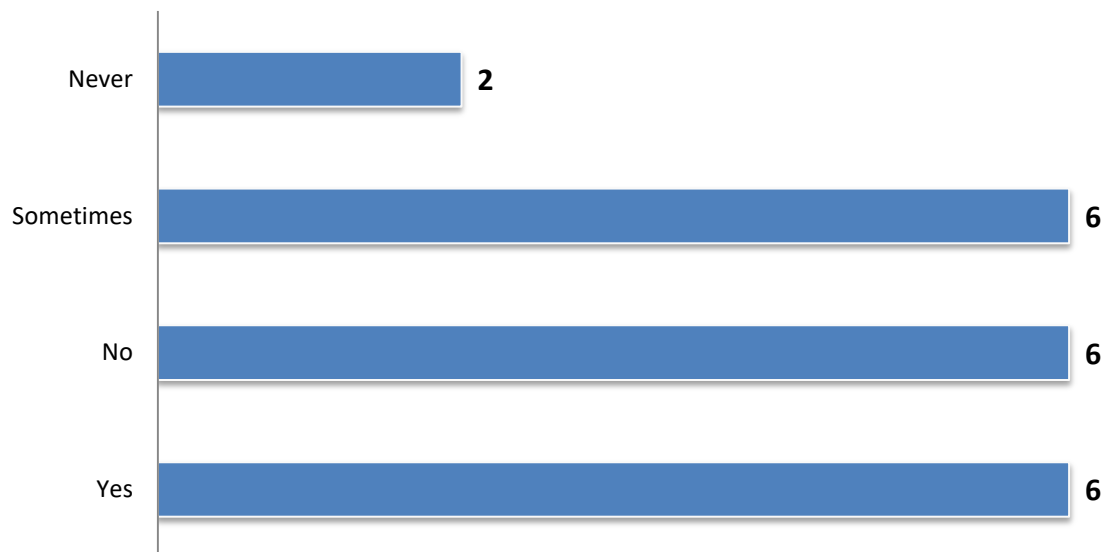


Figure 4-12 show the results of responses for recording steps in the patient notes. A total of 20 team members replied giving a question response rate of 71.4%. 7 team members or 35% reported recording steps in the patient notes, 8 team members or 40% did not, 3 members or 15% sometimes recorded steps in the paper notes and 2 team members or 10% never recorded pathway steps in the patient notes.

Figure 4-12: Recording pathway steps in the paper notes

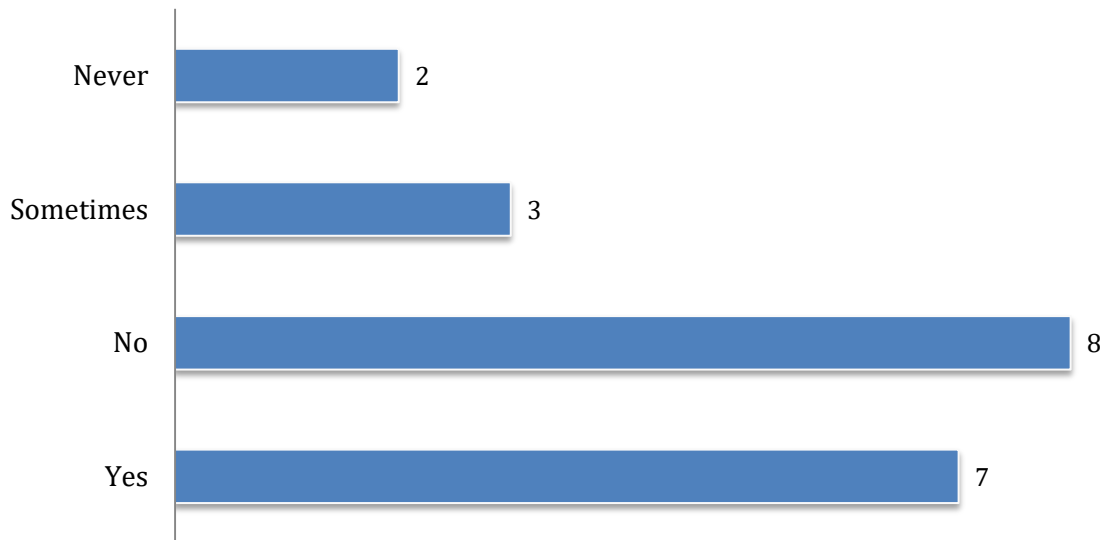
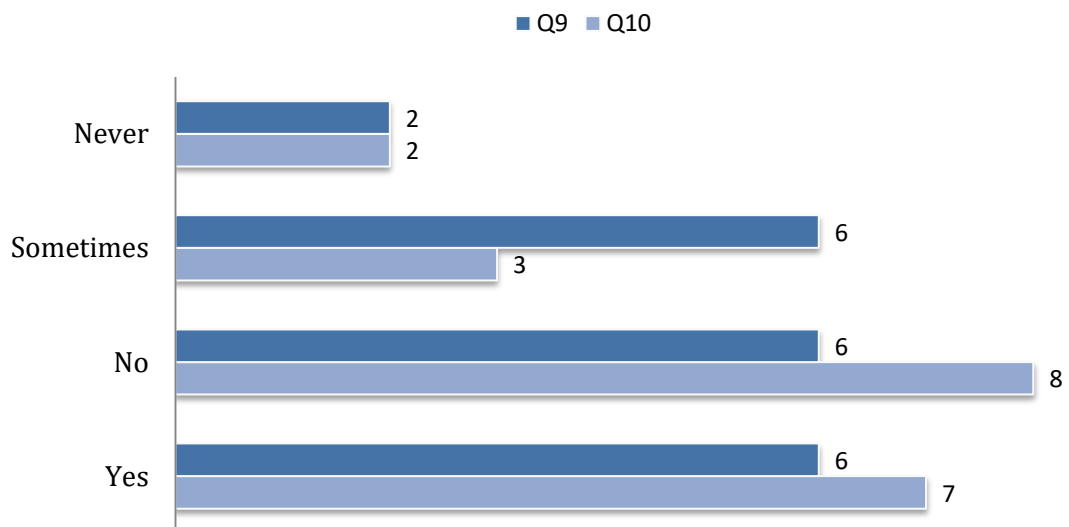


Figure 4- 13: Combined and contrasted from question 9 and 10

Figure 4.13: Combined answers from question 9 and 10



4.7 Pathway ease of use

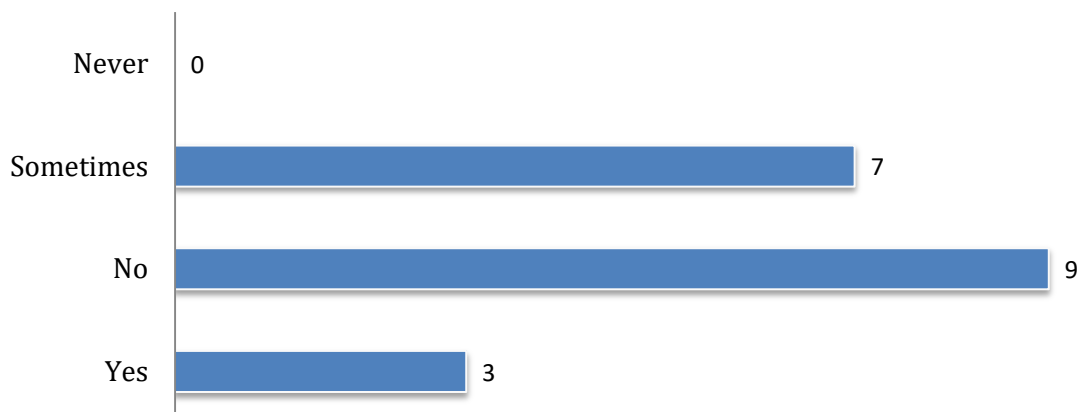
Questions 11 and 12 deal the issue of user friendliness of both the EPR and the patients' notes. The total number of replies for question 11 was 20 or 71.4%. When asked how user friendly the EPR is 5% or one respondent answered that it was not never user friendly. In both cases, 7 team members or 35% answered that it was sometimes or not user friendly and only 5 team members or 25% felt that it was user friendly.

Figure 4-14: Is the information about the patient pathway user friendly in the EPR



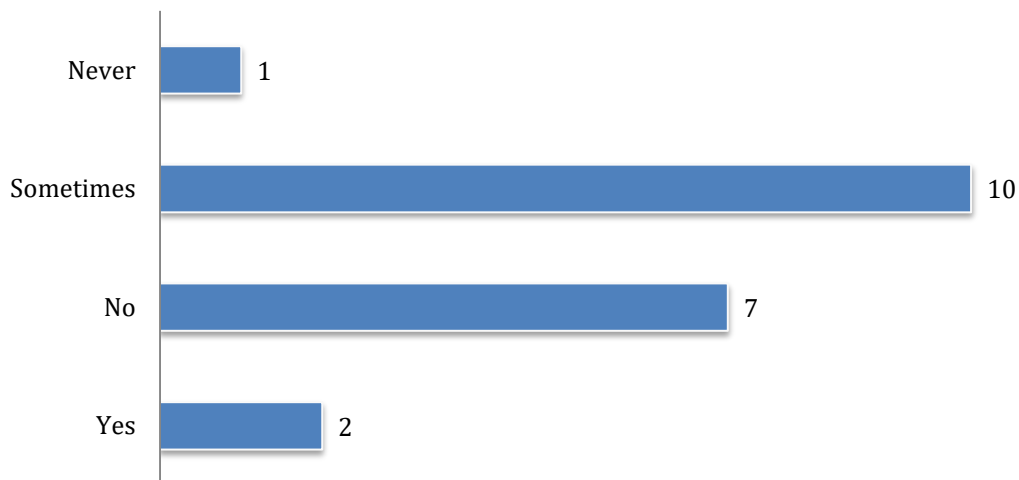
In the case of the patient chart, the total number of responses was 19 out of 28 giving a 67.8% response rate. 9 MDT members or 47% of the team did not find the information about the patient pathway user friendly in the patient notes. 7 respondents or 37% answered that they sometimes found it user friendly, while 3 team members or 16% answered yes. No respondents answered that they never found the information in patient notes user friendly.

Figure 4- 15: Is the information about the patient pathway user friendly in the patient notes



Question 13 is concerned with guiding the team members along the patient pathway. The total number of responses to this question was 20 giving a 71.4% response rate. 50% or 10 team members found that it was sometimes the case that the EPR guided them along the patient pathway. 7 team members or 35% said it did not, 2 (10%) answered Yes and 1 team member (5%) found that it was never the case that the EPR guided them along the pathway.

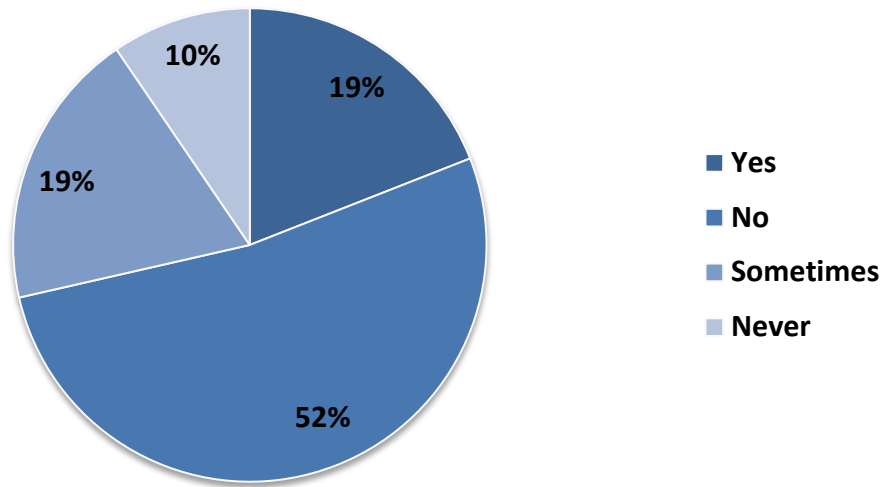
Figure 4- 16: Does the EPR guide along the expected patient pathway



4.8 Communication

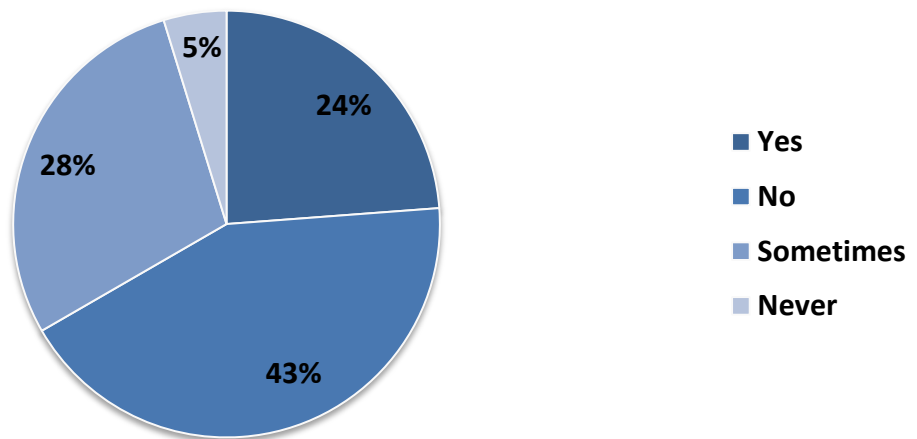
Question 14 asked if team members communicated with each other through the EPR. The total number of replies to this question was 21 giving a 75% reply rate. The largest number of team members answered that they did not use this method to communicate with other team members. 11 respondents or 52% said that they did not use the EPR to communicate with other members' of the team. In each case 19% or 4 MDT members answered yes and sometimes and 2 team members or 10% said they never use the EPR to communicate with other team members.

Figure 4- 17: Do you communication with other members of the multidisciplinary team through the EPR?



Question 15 asked if MDT members used this method to communicate requests to action a follow on step in the melanoma patient journey with other members of the team. 43% or 9 team members answered no, 24% or 5 answered that they did, while 6 (28%) said that they sometimes used this method to communicate an action. Only 1 respondent (5%) answered that they never used this method to communicate requests to action a follow on step.

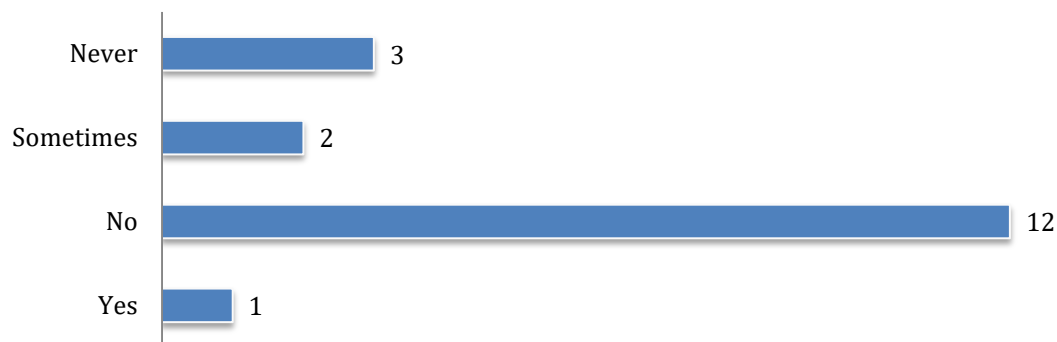
Figure 4-18: Requesting a follow on step in the melanoma patient journey.



4.9 Alerts

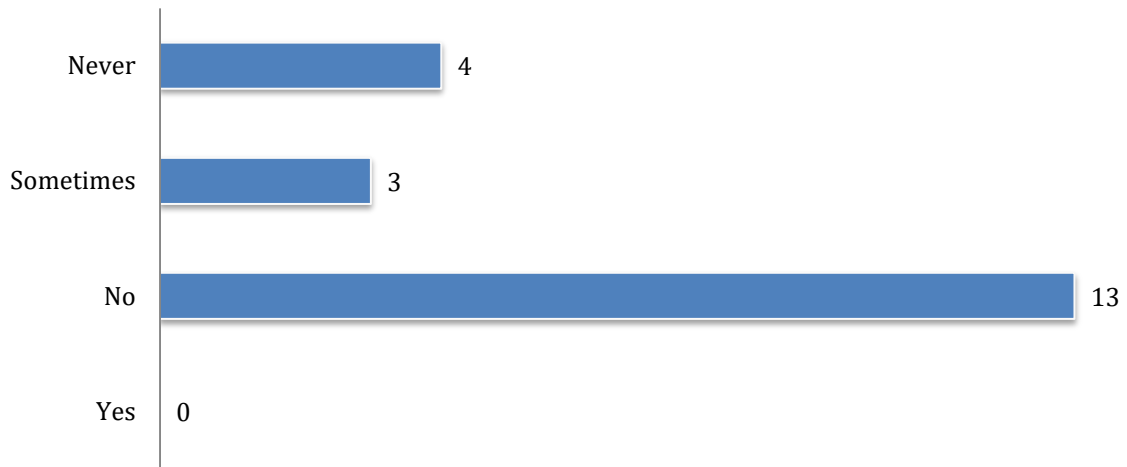
Questions 16 and 17 are concerned with establishing if the team member is alerted by either the patient notes or the EPR when a step in the patient journey has not been achieved. A total of 18 replies were received for question 16 which concerned the EPR, however 20 replies were received for question 17. Figure 4-19 shows the answers given in relation to the EPR, 67% (12) of respondents said that they were not alerted if a step along the patient pathway had been achieved. 2 (11%) said they were sometimes alerted, 1 (5%) answered yes and 3 (17%) said they were never alerted.

Figure 4-19: Does the EPR alert you if steps along the pathway are not achieved?



A total of 20 replies were received for question 17, which asked if the patient notes alerted team members if steps had not be achieved. Figure 4-20 shows the results registered for this question. 67% (13) of team members said that they were not alerted by the patient notes if a step along the way had not achieved. 3 (15%) team members answered sometimes and 4 (20%) answered never. No team member answered yes for this question.

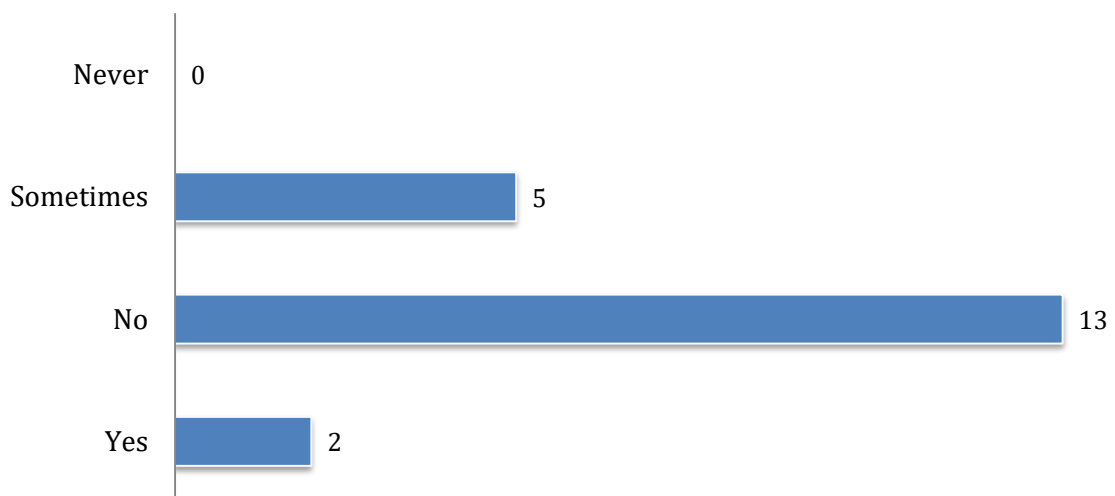
Figure 4-20: Do the patient notes alert you if steps along the pathway are not achieved?



4.10 Completion of steps

Question 18 asked if team members were aware when a step had been actioned or completed. The overall response rate was 71.4% for this question and the greatest number of team members answered that they were not aware when a step had been completed. 65% or 13 answered no to the question, 5 (25%) team members were sometimes aware and 2 team members or 10% answered that they were aware when a step had been completed. No responses were received for the never option.

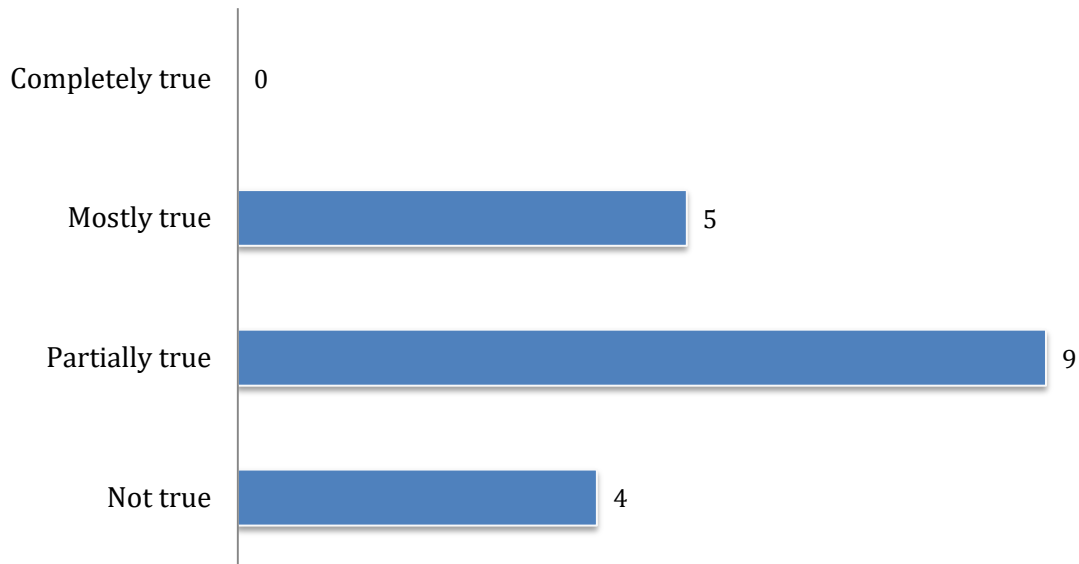
Figure 4-21: Are you aware when the next step has been actioned/ completed?



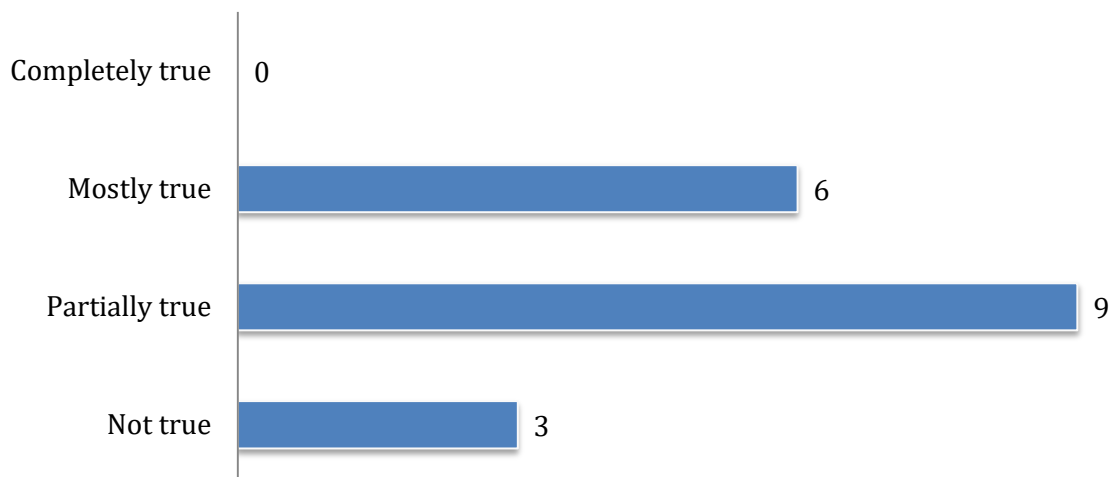
4.11 Information capture

Questions 19 and 20 asked respondents to state whether they felt the EPR and the patient notes captured all aspects of the melanoma pathway as shown in figure 4-22 and 4-23.

**Figure 4- 22: Please select one answer to the following statement:
The EPR captures all aspects of the melanoma pathway**

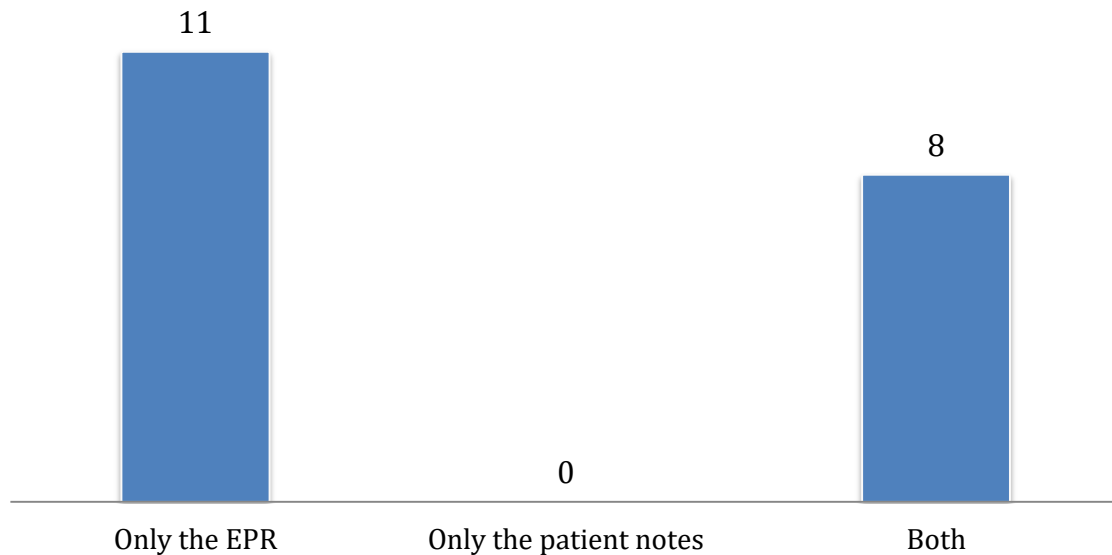


**Figure 4-23: Please select one answer to the following statement: The
patient notes capture all aspects of the melanoma patient pathway**



For the melanoma patient pathway would you prefer to use

Figure 4- 24: For the melanoma patient pathway would you prefer to use to use



4.12 Conclusion

The aim of this study was to ascertain multidisciplinary team members' use of an EPR in the care of malignant melanoma patients. The premise was that where a functional electronic patient record is available that it would be utilised in patient care and found to be of benefit to all team members. Though the sample size for this study was small by quantitative research standards the overall response rate of 75% was valuable in addressing the research question. Basic questions were posed and as a result extensive statistical analysis was not deemed necessary as there was not enough data provided for correlation purposes. The results for each question are presented in chart form and where applicable comparisons are represented in a bar chart.

The findings of the study appear to show that the EPR is not used as often or as consistently as had been anticipated. Considering that the majority of the respondents had used the current EPR for more than one year and it appears that it is still not viewed as a complete alternative to paper records. The questions posed aimed to evaluate the benefit and use of the system but perhaps, in hindsight more questions that probed the reasons for team members not using the system more regularly could have been asked. Limitations of the study are discussed further in chapter 6.

Chapter 5

Findings and discussion

5.0 Introduction

This chapter will discuss the findings of the questionnaire which were presented in chapter 5. The hypothesis for this study was that all members of the MDT used the EPR and found it beneficial in their daily workflow. The discussion will focus on whether the research hypothesis was proven or not. The question of whether the members of the multidisciplinary team utilise an electronic patient record for the melanoma patient pathway will be discussed in relation to the answers received.

5.1 Electronic Patient Record use

At the outset of the study it was important to establish what kind of experience user had of the current EPR and if they had previous experience of electronic patient medical records. The majority of respondents had used the current record for more the one year. This was surprising considering that the majority of the responses received were from the medical/surgical group of participants. This group is notoriously transient in their working environment and change work locations on a regular basis due to training and work practices. This may well account for the fact that 55% of respondents reported having had previous experience of EPR use. This presents an interesting point as very few Irish public hospitals use electronic records at present though some private hospitals do use EPR's. Also, as previously noted in the literature review confusion in regard to the definition of terms in relation to electronic patient records and electronic health record may well give rise to respondents not being fully aware of the type of system they were using. As many healthcare professionals work abroad it is not impossible that they were not aware of the type of system they were using. Nevertheless, the fact that the majority of respondents had reported previous of EPR's suggests that HIT implementation is possibly higher than expected.

5.2 EPR experience and training

As many researcher and authors have previously noted, ease of use of a system is one of the main reasons reported for uptake and use of that system. It was therefore important to establish

if current team members found the system easy to use and in this case the majority of team members reported that they did. This could well correlate with the fact that that 50% of respondents reported using the EPR for only 0- 24% of their work on the melanoma pathway. If team members are only using the system for specific reasons i.e. checking blood results or scans reports, very little access is needed when specific tasks are carried out. This may well be considered as a work around as users revert to what they know and use a system for specific tasks only and intermittently. Nonetheless the high response rate of team members saying that they find the system easy to use suggests that it meets one of the most important aspects of HIT design as suggested by the literature. The probability that the design of the system is user friendly is supported by the fact that 67% said they found it easy to use, while 24% said they found it easy to use sometimes. Considering that 67% reported that they did not feel that the training provided was adequate enough. Also 62% of team members were aware of where to avail of EPR training, however whether they did or not cannot be assumed in this study.

5.3 EPR and the patient pathway

This section will examine the data collected in relation accessing and recording patient information in both the EPR and the patient notes. The data collected aimed to establish the ease of use of the EPR and to contrast that with the data collected regarding the patient paper chart.

5.3.1 Accessing the data

As stated earlier, there is no established melanoma pathway in place, however despite the fact that the steps in the current process are somewhat informal; the process is well established and follows a pathway route. Establishing if team members felt that using the EPR was easy, as well as their previous experience of EPR's was expected to inform the questions regarding their pathway workload. It was hypothesised that ease of use of the EPR would encourage increased use of the system through all steps of the patient pathway and therefore produce a clearer, more definable workflow.

Though a majority of team members had previous experience with using EPR's and found this system easy to use, very little of their workflow was carried out through the system. 50% of the team reported using it for less than 24% of the melanoma pathway work. This could be due to that fact that 43% reported being unable to access information for the patient pathway through the current system. This appears to contradict earlier evidence of ease of use and further suggests that the system serves a repository for specific types of information i.e. blood results, rather than a functioning electronic record. Nevertheless, more team members reported being able to access the pathway data through the EPR than through the patient notes. This evidence

suggests that there is the potential for using the EPR more in relation to the pathway and offers the potential for possibly incorporating an electronic pathway into the current system, a fact validated by the response rate of 58% of team members who said that they would prefer to use only the EPR for the patient pathway. This is further supported by the 52% of team members who said that they were unable to access patient pathway information in the paper chart.

5.3.2 Recording the data

A key step in the patient pathway is to record the steps that have been taken and to make note of proposed treatment plans. This is routinely done at multidisciplinary team meetings and usually falls to one specific team member. Being able to access this data is vital to implementing further steps in the patients care therefore it is essential that it is easily accessible to all team members at any time. In the case of the melanoma MDT meeting the treatment plan is entered into the EPR at the meeting by the MDT coordinator, with the agreement of the team members present. However when treatment decisions are made outside of this meeting it is up to the individual team member to record the data in either the EPR or the patient chart thereby making it accessible to all team members. This also indicates that a step on the pathway has been discussed or actioned and has been recorded with a timeline.

5.3.3 Pathway guidance

One of the benefits of electronic systems is that they can allow users to accurately record and map the pathway process. Timelines are visible and team members should be able to see when and if a step in the process has been completed e.g. ordering blood tests or scan, if . To ascertain if the pathway process was user friendly team members were asked to give their opinion in relation to both the EPR and the patient notes. The answers given were essentially similar for both EPR and the patient chart although one less person unaccountably answered the question regarding the patient notes. The results show that only slightly more of the respondents, (25% versus 16%) found the pathway information user friendly in the EPR than in the patient notes, while a larger number did not find the pathway information in either the EPR (35%) or the patient notes (47%) to be user friendly. In the case of the EPR this could be due the fact that most users (50%) found that the system only sometimes guided them along the pathway. In the case of the patient notes it is not possible to state why users reported a lower satisfaction rating and without further research we can only surmise why this might be.

5.4 EPR benefits

This section will present the findings of questions 14 to 21 which examine the way in which an EPR could be utilised for communication, alerts and patient pathway information capture. This will be contrasted with the answers given in relation to the patient notes.

5.4.1 Communication

Good communication has been acknowledged to be an important aspect of promoting a positive working atmosphere within teams. Though the interpersonal relationships of the team were beyond the remit of this research the subject of communication, within the EPR was examined. A potentially beneficial aspect of the current EPR is that it has the ability to run an internal communication system by providing a messaging centre. A screenshot of this can be seen in Appendix J.

One of the research questions posed was if there was optimal communication among the multidisciplinary team. Questions 14 and 15 asked team members if they communicated with each other through the EPR messaging centre and if they used this option to communicate request a request for a follow up action in the patient pathway. This option would allow requests to action a further step in the patient pathway to be contained in each patients' record thereby providing a record of follow on steps, yet only 19% of team members reported using this method to communicate with other team members, while 19% of respondents reported using it sometimes but 52% said they did not use it at all. This is perhaps a wasted opportunity that could be used for audit purposes thereby providing evidence of timelines being met in treatment flow. Further evidence of this useful tool being underutilised was shown in question 15 where the majority of respondents reported not using the messaging centre to request a follow on action. Again only a small portion of team members (24%) said they used it to request a follow on action though the majority, 43%, said they did not use this tool and 28% said they used it sometimes. The reason for low usage of the messaging centre is that it does not provide an alert if an action has not been actioned and it is the duty of person being requested to carry out a follow on to complete the request. However this is not the remit of the messaging centre as it is merely an internal mailing system.

5.4.2 Pathway alerts

As previously noted in the literature alert systems within EPR's can notify clinicians of potential impending errors and issue alternatives to this action. Alert systems can also remind team members if they have not carried out an action. To examine this point study participants were

asked if the EPR alerted them if steps on the pathway had not been carried out. Only 18 team members answered this question which was one of the lowest response rates for the questions in the survey. The majority of respondents said that the EPR did not alert them, 67% of those who answered this question, yet 11% said that the system sometimes alerted them and 5% said it did. Though the evidence for an alert system is minimal it appears that this option is available in some form and could be further utilised by all the members of the team. In relation to the patient notes the majority of respondents also reported that this method did not alert them if an action had not been achieved and no team member answered yes again supporting the potential benefit of the EPR alert system.

5.5 Information capture

Response rates for the information capture questions were also low with only 18 team members completing both the questions in this section. Team members were asked if the firstly the EPR and then the patient notes captured all aspects of the melanoma pathway. It was noted again that the majority of respondents (50%) felt it was only partially true that both the modes captured all aspects of the melanoma patient pathway though slightly more team members (33%) this was the case for the patient notes then for the EPR (28%).

5.6 Preference

Finally when respondents were asked which method they would prefer to use for the melanoma patient pathway the majority said that their preference was for the EPR (58%) while 42% said they would prefer to use both the patient notes and the EPR. It can be argued that this supports a positive view of the EPR system by team members and a willingness to use it further in their practice.

5.5 Conclusion

This chapter has presented the findings of the study questionnaire by examining them under different headings. The purpose of the questions was to ascertain if members of a multidisciplinary team found the current EPR a useful tool in their work. Though the majority of the team reported not being satisfied with the training they received for the current EPR most found the system easy to use. Despite this it appears the utilisation, particularly in relation to the melanoma pathway was not consistent. It is not possible to say if this is due to the individual team members work remit. As this researcher wanted to study the overall use of the EPR by all

the team members and to identify usage in relation to a cancer pathway it was felt that ascertaining the benefit to all team members of greatest importance.

Chapter 6

Conclusions

6.0 Introduction

This chapter will provide a discussion on the limitations identified in the study and will present recommendations. A final conclusion to the study is also provided.

6.1 Study limitations

To the best knowledge of the researcher, this type of study had not been undertaken in an Irish hospital that utilised an EPR previously, which made it necessary to compile a list of questions to put to team members in order to ascertain their views. At the time of deciding what questions to ask, compiling the list questions, and deciding how to phrase the chosen questions the researcher was happy with the end result. However, in hindsight perhaps the wording of some of the questions could have been put differently. Also having been more informed by the answers received it is clear that further questions could have been asked to probe topics more deeply. For example, 55% of team members reported having had previous experience of EPR's however, it was not established what kind of systems these team members had used. Also, as had been noted previously in the literature review the term EPR and electronic health record (EHR) are used concurrently and can lead to confusion. In this instance posing a question to determine if users understood the definition of an EPR may have been helpful in assessing if indeed they had used such systems.

The questions regarding ease of use of the system could possibly now be seen as a subjective question as each person will have their own definition of what constitutes ease to them. However, as was previously stated, this piece of research was meant to be a starting point for further investigation on the topic. Continuing studies may benefit from examining this point further and examining the thoughts and feelings of team members in more depth.

6.2 Recommendations

Though we can learn valuable lessons from countries that have had been using electronic patient records over a number of years it cannot be speculated that such lessons are applicable to the Irish setting. Therefore it is the belief of this researcher the further, more probing studies on this topic would be of benefit to the future use and development of EPR's in the Irish setting. Though the hypothesis of this study was not proven valuable lessons were learned in relation the attitude of team members towards electronic systems.

6.3 Conclusion

The aim of this study was to investigate the workflow of a melanoma service utilising an electronic patient record. The setting for the study was a large Dublin public teaching hospital which has been using an EPR for over 10 years. The researcher wanted to explore the use of and attitudes to such a system in this unique setting. The development of electronic patient records and the push towards a national health record in Ireland necessitates the need for a better understanding of such systems use by Irish healthcare professionals. The hypothesis was that all members of a multidisciplinary team would use the system in their daily workflow and as a communication tool to request follow on steps in a patients care pathway. A literature review was carried out to examine current data and thinking in the fields of EPR, workflow, clinical pathways, patient safety and the multidisciplinary team. A quantitative research approach was deemed to be the most appropriate method for undertaking this research to preserve the anonymity of the participants. It was hoped that this approach would encourage a large number of the MDT to complete the study questionnaire. The overall participation rate of 75% was considered to justify choosing a quantitative research approach. Though the hypothesis was proved valuable lessons in regard to MDT member attitudes were learned. It was clear that an electronic system was in the main, viewed favourably and that there is potential to develop these systems further and expand their use in the clinical setting.

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Appendices

Appendix A: Participant Information Leaflet

STUDY TITLE

An investigation into the current workflow of a melanoma service utilising an Electronic Patient Record; possible short comings therein and potential solutions.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take some time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

WHO I AM AND WHAT THIS STUDY IS ABOUT

My name is Lisa McGowan and I am a 2nd year student undertaking an MSc in Health Informatics in Trinity College Dublin. I have been a nurse for over 20 years and have had experience of working in many different fields including research, cancer care and dermatology.

The purpose of my study is to try to discover how team members involved in the care of malignant melanoma patients carry out their work through an electronic patient record. I would like to find out if users find this to be a helpful tool in the melanoma patient care pathway, how your work is conducted and if there are any short-comings in this system that could potentially be improved upon.

WHAT WILL TAKING PART INVOLVE?

You will be asked to complete a questionnaire on line. You will be sent a link via email that has connected you to the questionnaire below. It should a maximum of 15 minutes to complete the questionnaire. Please do not name third parties anywhere in the questionnaire.

WHY HAVE YOU BEEN INVITED TO TAKE PART?

You have been asked to take part in this study because you participate in the care of malignant melanoma patients and because you use an electronic patient record (EPR) in this process.

DO YOU HAVE TO TAKE PART?

Your participation in this study is completely voluntary. You have the right to refuse to participate and right to refuse to answer any of the questions. You can withdraw from the study at any time without any consequences.

WHAT ARE THE POSSIBLE RISKS AND BENEFITS OF TAKING PART?

Your participation will provide information that will offer an insight into the workings of cancer care patient pathway when it is delivered through an electronic patient record. This information can then potentially be used to inform and improve the pathway process and ultimately improve patient care delivery. There are no foreseeable risks to you taking part in this study.

WILL TAKING PART BE CONFIDENTIAL?

All the information you provide will be confidential. At no time will you be identified or any institution be identified and you will not be asked to provide any personal information.

HOW WILL INFORMATION YOU PROVIDE BE RECORDED, STORED AND PROTECTED?

The information provided in the questionnaires will be stored securely on an encrypted device and will be irreversibly after my degree has been conferred. Only my supervisor and I will have access to the data collected.

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?

The information you provide will be published as part of my dissertation for an MSc in Health Informatics from Trinity College Dublin.

WHO SHOULD YOU CONTACT FOR FURTHER INFORMATION?

You can contact me at any time by email (mcgowanl@tcd.ie) or phone on 087 6674401.

THANK YOU

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I have received a copy of this agreement.

Appendix B: Informed Consent Form

STUDY TITLE

An investigation into the current workflow of a melanoma service utilising an Electronic Patient Record; possible shortcomings therein and potential solutions

LEAD RESEARCHER: Lisa McGowan

SUPERVISOR: Prof. Mary Sharp

BACKGROUND TO THE RESEARCH

The cancer care patient pathway is a well-structured means of guiding the management and treatment of cancer patients. It allows healthcare professionals to plan, implement and evaluate the care of the patients in conjunction with a multidisciplinary team. Internationally, electronic patient records (EPR) have been in use for some time and much has been written about the positive outcomes from using such a system. In Ireland too we are moving towards a national electronic health record and though we can draw on the experience of other countries to instruct the Irish journey, we can also learn from healthcare professionals in Ireland who have experience using an EPR in a daily clinical setting.

PROCEDURES OF THIS STUDY

You will be asked to complete a questionnaire online and the results from this will be analyzed for the purpose of the study. It should take a maximum of 15 minutes to complete the questionnaire.

PUBLICATION OF STUDY RESULTS

The information and data collected from this study will be published as part of a dissertation for my masters in Health Informatics (MSc) which I am undertaking in Trinity College Dublin. Individual results may be aggregated anonymously and research reported on aggregate results.

DECLARATION:

I am 18 years or older and am competent to provide consent.

I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.

I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.

I understand that if I make illicit activities known, these will be reported to appropriate authorities.

I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.

I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.

I understand that my participation is fully anonymous and that no personal details about me will be recorded.

I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:

Date:

Statement of investigator's responsibility

I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHER CONTACT DETAILS

Lisa McGowan. Email: mcgowanl@tcd.ie Tel: 087 667 4401

2nd year MSc student in Health Informatics, School of Computer Science and Statistics, Trinity College Dublin.

INVESTIGATOR'S SIGNATURE:

Date:

Appendix C: Study Questionnaire

All of the following questions are optional but it would be greatly help the research of if you could answer all the questions.

Please indicate your role:

I am:

Medical/ Surgical

Administration

Other

How long have you been using the current Electronic Patient Record (EPR)?

Less than 6 months

6 months- 1 year

More than 1 year

Do you have previous experience of working with electronic patient records?

Yes

No

Do you find the current electronic patient pathway easy to use?

Yes

No

Sometimes

Do you feel that the training you received for this EPR was adequate?

Yes

No

Are you aware of where to avail of EPR training?

Yes	No
-----	----

In relation to the melanoma patient pathway approximately how much of your work is carried out through the electronic patient record?

0- 24%	25- 49%	50- 74%	75% +
--------	---------	---------	-------

Can you access all of the information that shows the patient pathway through:
a) EPR?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Can you access all of the information that shows the patient pathway through:
b) patient notes?

Yes	No	Sometimes	Never
-----	----	-----------	-------

When you have been involved in steps in the patient pathway do you record these:
a) In the EPR?

Yes	No	Sometimes	Never
-----	----	-----------	-------

When you have been involved in steps in the patient pathway do you record these:
a) In the patient notes?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Is the information about the patient pathway user friendly:

a) In the EPR?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Is the information about the patient pathway user friendly:

b) patient notes?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Does the EPR guide you along the expected patient pathway?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Does the EPR guide you along the expected patient pathway?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Do you communicate with other members of the multidisciplinary team through the EPR?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Do you use this method to communicate requests to action a follow on step in the melanoma patient journey with other members of the team?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Does the EPR alert you if steps along pathway are not achieved?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Do the patient notes alert you if steps along pathway are not achieved?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Are you aware when the next step has been actioned/ completed?

Yes	No	Sometimes	Never
-----	----	-----------	-------

Please select one answer to the following statement:

The EPR captures all aspects of the melanoma patient pathway-

Not true	Partially true	Mostly true	Completely true
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Please select one answer to the following statement:

The patient notes capture all aspects of the melanoma patient pathway-

Not true	Partially true	Mostly true	Completely true
----------	----------------	-------------	-----------------

For the melanoma patient pathway would prefer to use-

Only the EPR	Only patient notes	Both
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Appendix D: Ethics Approval from Trinity College Dublin

The screenshot shows a Gmail interface with the following elements:

- Browser Address Bar:** <https://mail.google.com/mail/u/0/?tab=wm#inbox/15bfd3a8f45f3cd9>
- Navigation:** General, Thesis, Articles, TCD, Academic. Search bar with "MYzone" logo.
- Mail Header:** "3 of 242" with navigation arrows and a settings gear.
- Compose Button:** A red "COMPOSE" button is visible.
- Left Sidebar:** Lists "Inbox", "Starred", "Sent Mail", "Drafts", and "More". A contact card for "McGowan" is shown.
- Chat Widget:** A speech bubble icon with the text "No recent chats. Start a new one".
- Email Subject:** "TCD REC WebApp: The status of 'An investigation into the current workflow of a melanoma service utilising an Electronic Patient Record; possible short comings therein and potential solutions' (228) has been updated by the Committee".
- Sender:** "rec-app-help@tchpc.tcd.ie" (12 May (2 days ago)).
- Body Text:**
 - "The status of 'An investigation into the current workflow of a melanoma service utilising an Electronic Patient Record; possible short comings therein and potential solutions' has been updated by the Committee."
 - "Title: 'An investigation into the current workflow of a melanoma service utilising an Electronic Patient Record; possible short comings therein and potential solutions'"
 - "Applicant Name: Lisa McGowan"
 - "Submitted by: Lisa McGowan"
 - "Academic Supervisor: Mary Sharp"
 - "Application Number: 20170206"
 - "Result of the REC Meeting: Approved"
 - "The Feedback from the Committee is as follows: This work may proceed. Best of luck with your project."
 - "The application can be viewed here: https://webhost.tchpc.tcd.ie/research_ethics/?q=node/228"
 - "If amendments are required, please use the following link to edit the application and upload the changes: https://webhost.tchpc.tcd.ie/research_ethics/?q=node/228/edit"

Appendix E: Ethics Approval from St. James Hospital

The screenshot shows an email client interface with the following elements:

- Header:** (myzone) logo, search bar, and navigation icons.
- Left Sidebar:** Mail folder, Compose button, and a list of folders: Inbox, Starred, Sent Mail, Drafts, and More. Below this is a contact list showing 'McGowan' with a plus sign.
- Chat Area:** A bubble icon with the text 'No recent chats Start a new one'.
- Email Header:** From: Claire Hartin <Claire.Hartin@amnch.ie>, To: me, Date: 25 Jan, and a 'People (2)' link.
- Email Body:**
 - Greeting: 'Dear Lisa,'
 - Text: 'Thank you for your email. Your proposed research is something that SJH/AMNCH REC would consider peer-to-peer research and is something which we would neither review or deduce any ethical issues with as you will find outlined on our website which reads - *Research involving, e.g. surveys of staff or process changes to improve operational efficiency are probably not our business although approval by hospital management is likely to be required*. I note you have hospital permission via the head of Department, Dr Patrick Ormond.'
 - Text: 'This email should be sufficient if there are any queries regarding you seeking the opinion of an ethics committee with regard to any publication that may emanate out of your proposed research. Best of luck with same.'
 - Text: 'Kind regards'
 - Signature: A handwritten signature 'CHartin'.
 - Contact Info: 'Claire Hartin, MSc, PGDip, BA (Hons) Research and Ethics Administrator | Medical Board Secretariat Research and Ethics Dept. | Tallaght Hospital | Tallaght | Dublin 24 T: 353 1 4142199 | E: claire.hartin@amnch.ie W: <http://www.tallaghthospital.ie/About-us>
- Footer:** 'From: McGowan Lisa [mailto:mcgowanl@tcd.ie]' Sent: 24 January 2017 14:33 To: Claire Hartin <Claire.Hartin@amnch.ie> Subject: MSc Ethics approval

Appendix F: National Pigmented lesion Referral form

A patient with a suspected melanoma may be referred to a consultant dermatologist or plastic surgeon for diagnosis. All patients with a confirmed melanoma should be discussed at the melanoma or skin cancer MDT at the Cancer Centre for Further Management.

Patient Details	
Surname: _____	
First Name: _____	DOB: _____
Address: _____ _____	
Mobile No: _____	Tel day: _____
Tel evening: _____	
Hospital No. (if known): _____	
First language: _____	Interpreter required: Yes <input type="checkbox"/> No <input type="checkbox"/>
Gender: Male <input type="checkbox"/> Female <input type="checkbox"/>	Wheelchair assistance: Yes <input type="checkbox"/> No <input type="checkbox"/>

General Practitioner Details	
Name: _____	
Address: _____ _____	
Telephone: _____	Mobile: _____
Fax: _____	
GP Signature: _____	Date of Referral: _____
Medical Council Registration No: _____	

Referral Information (please tick relevant boxes):

<p>Is this a pigmented lesion?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Site: _____ Size: _____ mm</p> <p>Duration of symptoms _____ (weeks)</p>	<p>Do you think this is:</p> <p><input type="checkbox"/> A likely melanoma</p> <p><input type="checkbox"/> A changing mole - requires assessment</p> <p><input type="checkbox"/> A benign mole, but would like an opinion</p> <p><input type="checkbox"/> Ugly duckling sign (Mole or lesion which looks different than the patient's other moles)</p> <p><input type="checkbox"/> Other (please specify) _____</p>
--	--

MELANOMA CHARACTERISTICS:	Risk Factors
<p>The ABCDE Lesion System</p> <p><input type="checkbox"/> A Asymmetry in two axes</p> <p><input type="checkbox"/> B Irregular Border</p> <p><input type="checkbox"/> C At least two different Colours in lesion</p> <p><input type="checkbox"/> D Maximum Diameter >6mm</p> <p><input type="checkbox"/> E Evolution of lesion</p>	<p><input type="checkbox"/> Atypical moles</p> <p><input type="checkbox"/> A large number of moles (>50)</p> <p><input type="checkbox"/> Fair complexion e.g. fair skin, blue eyes, red/blond hair</p> <p><input type="checkbox"/> A previous melanoma or other non-melanoma skin cancer</p> <p><input type="checkbox"/> Immunosuppression</p> <p><input type="checkbox"/> A family history of melanoma</p> <p><input type="checkbox"/> History of childhood sunburn</p> <p><input type="checkbox"/> Sun bed exposure</p>

<p>Past medical history:</p> <p>Anticoagulants: Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Aspirin <input type="checkbox"/> Flax <input type="checkbox"/> Warfarin <input type="checkbox"/> Other <input type="checkbox"/></p> <p>If yes please specify _____</p> <p>Allergies: Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes please specify _____</p>	<p>Comments:</p>
---	---

FOR HOSPITAL USE:		Skin Team Triage
Date of referral received: _____		<input type="checkbox"/> Urgent referral
Date of appointment offered: _____	Dates patient available: _____	<input type="checkbox"/> Soon
Reason patient did not accept first appointment offered: _____		<input type="checkbox"/> Routine referral
		Triage by: _____

Appendix G: National Melanoma G.P. Referral Guidelines



NATIONAL MELANOMA GP REFERRAL GUIDELINES



A patient with a suspected melanoma may be referred to a consultant dermatologist or plastic surgeon for diagnosis. All patients with a confirmed melanoma should be discussed at the melanoma or skin cancer MDT at the cancer centre for further management.

Every year in Ireland, over 700 new cases of melanoma are diagnosed. There are 100 melanoma related deaths. Over 60% of patients are female. It is the third most common cancer diagnosed in the 15-44 year age group. The cumulative risk of developing a melanoma before the age of 75 is 1 in 78 for males and 1 in 80 for females.

Data Source: National Cancer Registry, Ireland

RISK FACTORS

- Atypical moles
- A large number of moles (>50)
- Fair complexion e.g. fair skin, blue eyes, red/blond hair
- A previous melanoma or other non-melanoma skin cancer
- Immunosuppression
- A family history of melanoma
- History of childhood sunburn
- Sun bed exposure

GENERAL RECOMMENDATIONS

The prognosis for melanoma is closely related to the thickness of the tumour. A patient who presents with signs and symptoms suggestive of melanoma should be referred to a consultant dermatologist or consultant plastic surgeon. Primary healthcare professionals should encourage all patients to be aware of skin changes, in order to minimise delay in presentation of symptoms. Lesions suspicious of melanoma should not be removed in primary care.

GP BIOPSY ADVICE

If a patient presents with a suspicious pigmented lesion the patient should be referred with the lesion intact to a consultant dermatologist or consultant plastic surgeon.

All excised lesions should be sent for histopathological diagnosis. Prophylactic excision of naevi in the absence of suspicious features should not be carried out.

If a melanoma has been inadvertently excised, the patient should be referred urgently to a consultant dermatologist or consultant plastic surgeon for multi-disciplinary follow-up and care. Shave excisions and punch biopsies should not be carried out on naevi.

OPPORTUNISTIC ASSESSMENT

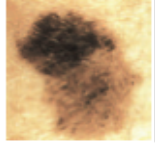
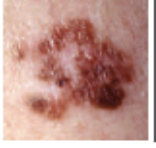
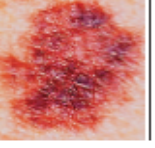
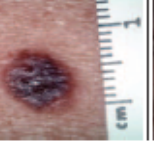
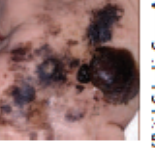
General practitioners are encouraged to opportunistically assess patients attending their practice for signs of skin malignancy.

To make a referral, FAX, or POST a **PIGMENTED LESION REFERRAL FORM**. Additional forms can be obtained by ringing the National Cancer Control Programme on (01) 828 7100 or by logging onto www.cancercontrol.hse.ie

SUSPICIOUS LESIONS WHICH MAY REQUIRE URGENT REFERRAL TO A CONSULTANT DERMATOLOGIST OR PLASTIC SURGEON

- Any new or changing lesion which is pigmented
- A long-standing pigmented lesion which is changing progressively in shape, size or colour regardless of age
- A new pigmented line in a nail, especially where there is associated damage to the nail, or a lesion growing under a nail.
- A pigmented lesion which has changed in appearance or which is persistently itching or bleeding
- An "Ugly Duckling", pigmented lesion, is one that looks different to all the other pigmented lesions

The ABCDE Lesion System

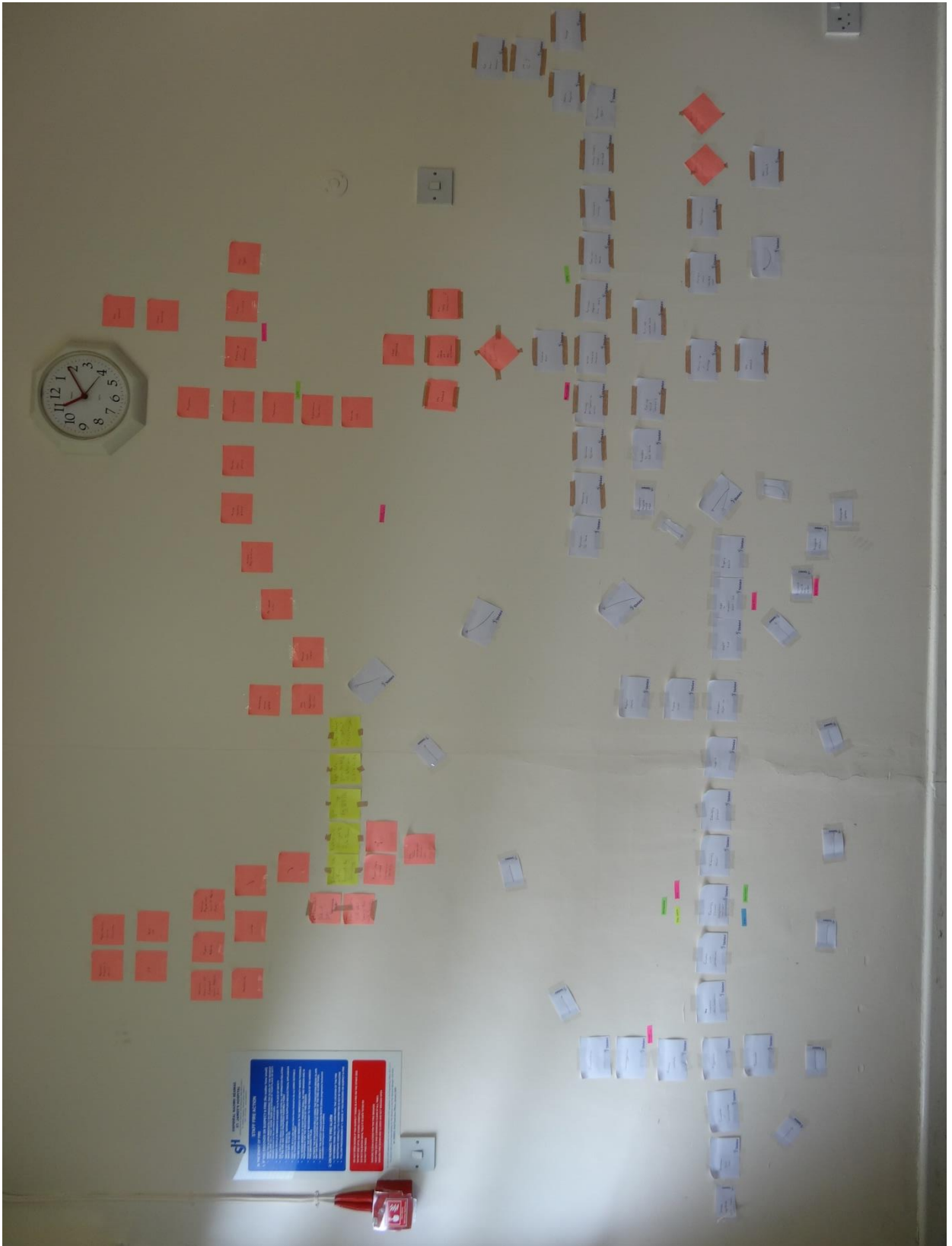
 <p>A Asymmetry in two axes</p>	 <p>B Irregular Border</p>	 <p>C At least two different Colours in lesion</p>	 <p>D Maximum Diameter >6mm</p>	 <p>E Evolution of lesion</p>
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Photograph reproduced courtesy of British Columbia Cancer Agency

This guideline represents the view of the NCCP, which was arrived at after careful consideration of the evidence available. Health professionals are expected to take it fully into account when exercising their clinical judgement. The guideline does not, however, override the individual responsibility of health professionals to make decisions appropriate to each patient. This guideline will be reviewed as new evidence emerges, and supersedes all previous skin cancer guidelines. Version 1.0 – November 2010, © NCCP

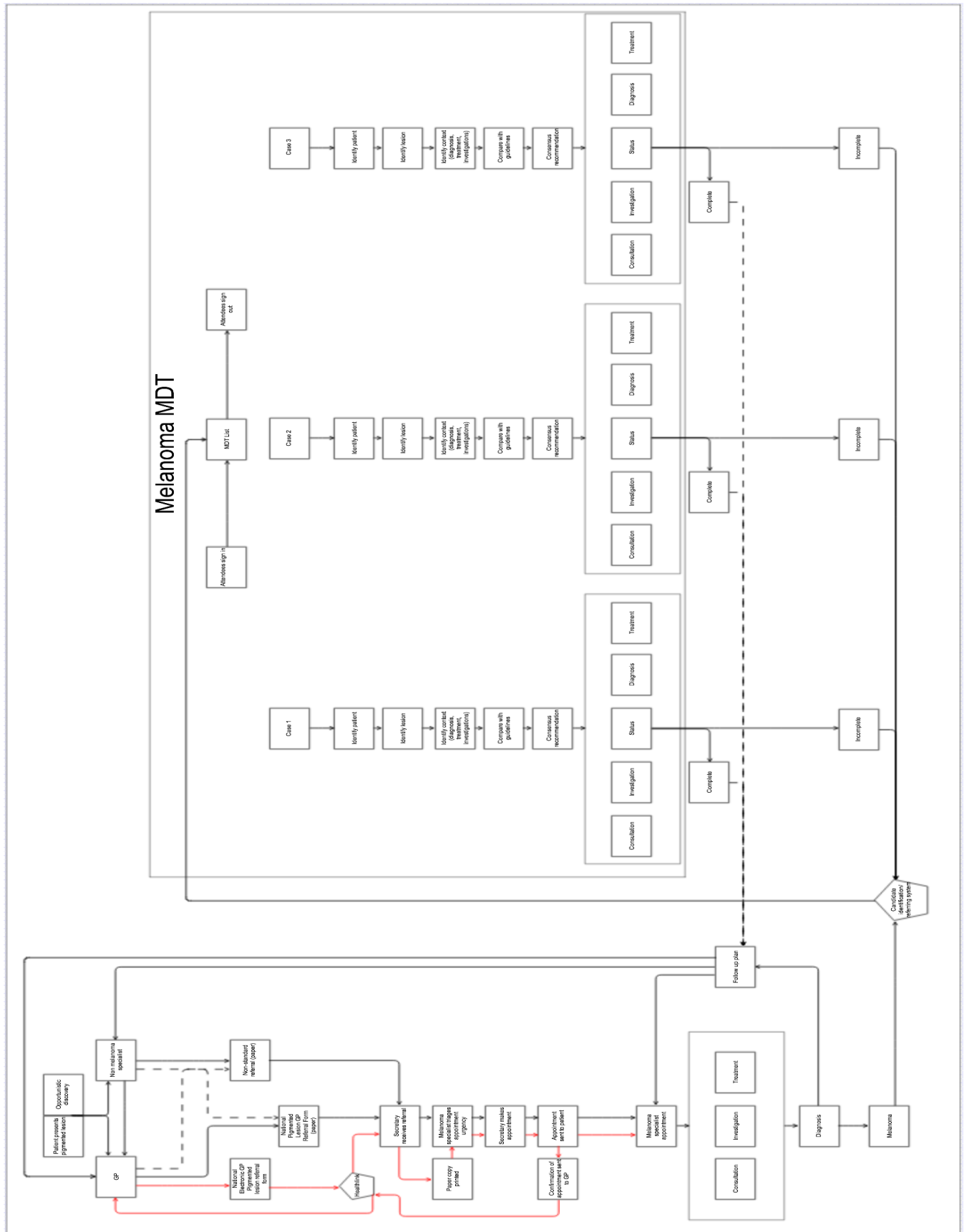
Source: HSE

Appendix H: Photo of wall showing map of patient pathway



Appendix I: An Overview of the pigmented lesion care pathway in Ireland

Reproduced from Dmitri Wall and C. Gregory Johnson



Appendix J: Image of EPR messaging centre

