

# Digitising clinical service records in community pharmacy

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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.

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## Abstract

### Introduction

Clinical pharmacy service consultation records are currently recorded on paper-based forms which need to be designed, printed and delivered to each pharmacy for use. Paper records have been criticised for their limited accessibility and incompleteness with studies demonstrating that information from paper-based records can be vague, illegible, ambiguous and hard to extract. Some of the potential benefits of digitising clinical service records in community pharmacy include: improved data quality and patient safety, increased efficiencies and productivity and the ability to mine data for research purposes.

### Aims

This research aims to investigate the potential benefits and challenges of digitising clinical service record forms in community pharmacy.

### Methods

The research methods employed consisted of a comprehensive literature review, an analysis of a sample of paper-based records, a description of electronic recording systems currently used within the community pharmacy sector and semi-structured interviews. The sample of paper-based records are used to describe the type of data that is captured currently and the potential value in digitising this data. The semi-structured interviews were conducted with relevant stakeholders to gain their views and insights on digitising clinical pharmacy service records.

### Results

It is clear from the research that there are vast amounts of valuable data locked in to paper-based records in community pharmacy. However, the research also demonstrated that these paper-based records contain significant amounts of missing or incomplete data. Results from both the literature review and the interviews revealed many potential benefits but equally many challenges for digitising clinical service records.

### Discussion

It was concluded that moving from a paper-based consultation recording system to an electronic system has many potential benefits in terms of accuracy of records, electronic data capture, timely patient insights and rich datasets for research which could highlight the benefit of community pharmacy services. To successfully implement digital records, challenges such as resistance to change, integration, interoperability and cost must be appropriately addressed.

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## Abbreviations

ABPM	Ambulatory Blood Pressure Monitoring
ADE	Adverse Drug Events
CARDI	Centre for Ageing Research and Development in Ireland
CCG	Clinical Commissioning Group
CDC	Centres for Disease Control and Prevention
CPOE	Computerised Physician Order Entry
DOHC	Department of Health and Children
EHR	Electronic Health Record
EPR	Electronic Patient Record
GP	General Practitioner
HIQA	Health and Information Quality Authority
HIT	Health Information Technology
HPRA	Health Products Regulatory Authority
HSE	Health Service Executive
ICT	Information and Communication Technology
IHI	Individual Health Identifier
IPU	Irish Pharmacy Union
LPC	Local Pharmaceutical Committees
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
OTC	Over the Counter
PCRS	Primary Care Reimbursement Service
PCT	Primary Care Team
PHR	Personal Health Record
PMR	Patient Medication Record
PPS	Personal Public Service
PSI	Pharmaceutical Society of Ireland
PSNC	Pharmaceutical Services Negotiating Committee

## Chapter 1. Introduction

*“Adoption of health information technology (HIT), including electronic health records (EHRs), is essential for the transformation of the healthcare system into one that is more efficient, is safer, and consistently delivers high-quality care.”*

(Bowman, 2013)

### 1.1 Background and Motivation

The vast majority (90-95%) of healthcare needs can be addressed in the primary care setting (DOH, 2001) and it has been demonstrated that robust primary care systems have led to improved healthcare outcomes in the community (Macinko et al., 2003). Ireland is now beginning to catch up with other European countries in terms of population ageing with people in Ireland living longer than previous generations (PSI, 2016b). As the population ages, the increasing prevalence of chronic disease coupled with complex medical conditions will have profound implications on the health system. It is already estimated that approximately 38% of Irish people over 50 years have one chronic disease and 11% have more than one (DOH, 2016). Convincing international evidence has shown that expanding the scope of the services provided by community pharmacists in Ireland will reduce pressure on the Irish health service (IPU, 2015).

In addition to dispensing prescriptions and supervising the sale and supply of non-prescription medicines, many pharmacies now offer a wide range of clinical services. For example, during the 2014/15 season, 53,047 patients were vaccinated in Irish pharmacies (PSI, 2016a). Healthcare professionals such as community pharmacists need to keep records of patient care and clinical services to ensure the safety, quality, consistency and continuity of care for their patients. Records of patient care are also essential to enable the professional to respond to any questions that might arise subsequently about the care a patient has received (Goundrey-Smith, 2012).

Currently pharmacy service consultation records such as for the winter flu vaccination service (Appendix A) are recorded on paper-based forms which need to be designed, printed and delivered to each pharmacy for use. These paper-based records are then retained as paper records post consultation. For example, all records relating to the administration of vaccines

must be kept at the pharmacy premises where the vaccine was administered for two years and must also be kept by the pharmacy owner for at least eight years (PSI, 2016c). The continuous supply of required consultation records can be problematic and amending of consultation records for any reason (e.g. clinical update) can be both costly and time consuming.

Paper-based systems have often led to “*inaccurate, incomplete, untimely, fragmented, duplicative and poorly documented*” information (Pierre, 2004), with audits of paper records having revealed significant amounts of incomplete patient records (Young et al., 1998, Hippisley-Cox et al., 2003, Carroll et al., 2003, Hogan and Wagner, 1997). Moving from a paper-based system to an electronic system for healthcare records has many potential benefits in terms of accuracy and completeness of records with Tsai et al. demonstrating that when compared to paper records electronic medical records were 40% more complete (Tsai and Bond, 2008). It is also important to note that paper-based records do not lend themselves to convenient audit and research activities.

The healthcare industry has an increasing need for clinical data to support both patient care and data reuse. Data reuse or secondary use of data is essential for improving the safety, quality and efficiency of healthcare (Barton et al., 2011). Winslow in 1920, described public health as “*the science and art of preventing disease, prolonging life and promoting health and efficiency through organised community efforts*” (Winslow, 1920). The core functions of public health are underpinned by a requirement for health data (HIQA, 2012a). The ability of community pharmacists to record clinical pharmacy service consultations electronically would potentially ensure high quality clinical information is recorded in an accurate, complete and consistent manner. Introducing such a system of electronically recording clinical pharmacy services consultations would have potential benefits such as the ability to form a live database suitable for research analysis.

## 1.2 Research Questions

The research questions to be answered in the dissertation are:

- What are the potential benefits of digitising clinical service records in community pharmacy?

- What are the challenges for digitising clinical service records in community pharmacy?

### 1.3 Overview of the Research

In an attempt to answer the above research questions, this dissertation comprises four distinct sections.

The first part of the research involved a comprehensive review of the available literature to:

- Explore the potential benefits of digitising clinical service records in community pharmacy.
- Seek to understand the challenges for digitising clinical service records in community pharmacy.
- Gain an understanding of systems used to electronically record clinical services in community pharmacy currently.

The second part of the research involved illustrating the types of data that are currently captured on paper-based consultation records within community pharmacy. This endeavoured to demonstrate the wealth of data that is currently 'locked' into community pharmacy. This chapter serves to describe the type of data that is captured currently and the potential value of digitising this data.

The third part of the research involved describing electronic recording systems that are used currently within the pharmacy sector to explore their functionality, usability and potential benefits. The researcher analysed a system that is used currently within the community pharmacy sector in England and a system that is used within community pharmacy sector in Ireland. This description provided insights for the future design and development of electronic recording systems for clinical pharmacy service consultations within community pharmacy.

The last part of the research involved conducting semi-structured interviews with participants based on their background and interests in the research topic. The objective was to gain insight into the views of participants on digitising clinical service records in community pharmacy. Topics discussed in the semi-structured interviews included benefits and challenges of digitising clinical service records in community pharmacy.

## 1.4 Overview of the Dissertation

Chapter 1 introduces the dissertation topic, presents the motivation for the research and outlines the research questions to be addressed.

Chapter 2 presents the methods and findings of the literature review.

Chapter 3 describes the research methodology used to answer the research questions and assesses the limitations of the methodology used.

Chapter 4 illustrates the types of data that are currently captured on paper-based consultation records within community pharmacy and the potential value of digitising this data.

Chapter 5 describes two electronic recording systems that are used currently within the pharmacy sector to explore their functionality, usability and potential benefits.

Chapter 6 evaluates and analyses the results of the semi-structured interviews. This chapter endeavours to answer the research questions by analysing and discussing the results and conclusions from the previous chapters.

Chapter 7 concludes the dissertation. Areas for further work are recommended together with the strengths and limitations of the research.

## Chapter 2. Literature Review

### 2.1 Introduction

The literature review stage of the research investigates the various aspects relevant to the research questions and objectives. The literature review was used as an opportunity to review, explore and evaluate the research previously undertaken in relation to the topics of this study. In this chapter, the methods and results of the literature review are presented. A review of the literature allows the researcher to gather information about research design, data collection and analysis methods, as well as assembling data and conclusions across research (Fink, 2014).

### 2.2 Methods

A comprehensive review of the literature was conducted. A systematic search was undertaken using the following online databases: PubMed, Scopus, Web of Science, The Cochrane Library, Lenus and Google Scholar. The keywords that were used for the search included: “medical records”, “patient records”, “pharmacy records”, “electronic records”, “clinical records”, “digital”, “electronic”, “digitising”, “digitization”, “digitisation”, “pharmacy”, “pharmacist” and “pharmacies”. The researcher chose the above keywords with the anticipation that they would yield the most relevant results for then chosen topic. When available the advanced search tool was used and limits such as English language were imposed. For the PubMed database, the Medical Subject Headings (MeSH) search tool was used to assist for the keyword “medical records”. Figures 2.1, 2.2 and 2.3 show the results of the searches undertaken in PubMed, Scopus and Web of Science respectively. The literature search was refreshed at intervals to include any emerging information on the topic with the final review completed on the 1<sup>st</sup> June 2017. As the research topic of digitising clinical pharmacy consultation records is relatively niche, the researcher thoroughly examined the results of the literature review so as not to miss any relevant and significant research.

Search	Add to builder	Query	Items found	Time
#3	<a href="#">Add</a>	Search ((pharmacy) AND (((("Medical Records"[Mesh]) OR "clinical records") OR "patient records") OR "pharmacy records")) AND (((digital) OR electronic) OR digitising) OR digitization) OR digitisation) Filters: Humans	<a href="#">821</a>	07:04:06

Figure 2.1: Results from PubMed search

<input type="checkbox"/>	( TITLE-ABS-KEY ( "medical records" ) OR TITLE-ABS-KEY ( "patient records" ) OR TITLE-ABS-KEY ( "clinical records" ) OR TITLE-ABS-KEY ( "pharmacy records" ) OR TITLE-ABS-KEY ( "electronic records" ) )	22 Jan 2017	259,449
<input type="checkbox"/>	( TITLE-ABS-KEY ( digital ) OR TITLE-ABS-KEY ( electronic ) OR TITLE-ABS-KEY ( digitization ) OR TITLE-ABS-KEY ( digitisation ) OR TITLE-ABS-KEY ( digitising ) )	22 Jan 2017	1,823,899
<input type="checkbox"/>	( TITLE-ABS-KEY ( pharmacy ) OR TITLE-ABS-KEY ( pharmacist ) OR TITLE-ABS-KEY ( pharmacies ) )	22 Jan 2017	148,434
<input type="checkbox"/>	(( TITLE-ABS-KEY ( pharmacy ) OR TITLE-ABS-KEY ( pharmacist ) OR TITLE-ABS-KEY ( pharmacies ) ) AND (( TITLE-ABS-KEY ( digital ) OR TITLE-ABS-KEY ( electronic ) OR TITLE-ABS-KEY ( digitization ) OR TITLE-ABS-KEY ( digitisation ) OR TITLE-ABS-KEY ( digitising ) ) AND (( TITLE-ABS-KEY ( "medical records" ) OR TITLE-ABS-KEY ( "patient records" ) OR TITLE-ABS-KEY ( "clinical records" ) OR TITLE-ABS-KEY ( "pharmacy records" ) OR TITLE-ABS-KEY ( "electronic records" ) ) ) AND ( LIMIT-TO ( LANGUAGE , "English" ) ) )	22 Jan 2017	1,920

Figure 2.2: Results from Scopus search

Set	Results	Save History / Create Alert	Open Saved History	Edit Sets	Combine Sets AND OR Combine	Delete Sets Select All Delete
# 4	265 #3 AND #2 AND #1 <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years</i>			Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 3	51,521 TOPIC: (pharmacist) OR TOPIC: (pharmacies) OR TOPIC: (pharmacy) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years</i>			Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 2	1,105,811 TOPIC: (digital) OR TOPIC: (electronic) OR TOPIC: (digitization) OR TOPIC: (digitisation) OR TOPIC: (digitising) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years</i>			Edit	<input type="checkbox"/>	<input type="checkbox"/>
# 1	69,890 TOPIC: ("medical records") OR TOPIC: ("clinical records") OR TOPIC: ("patient records") OR TOPIC: ("electronic records") AND TOPIC: ("pharmacy records") <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC Timespan=All years</i>			Edit	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2.3: Results from Web of Science search

Information was also obtained from other sources such as the Pharmaceutical Society of Ireland (PSI), the Irish Statute Book, the Irish Pharmacy Union (IPU), the Department of Health, the Health Service Executive (HSE), the Irish Health Information and Quality Authority (HIQA), eHealth Ireland and the Trinity College Dublin Library.

### 2.3 Healthcare in Ireland

Healthcare in Ireland is a two-tiered model consisting of both a public and a private sector, with multiple providers of healthcare in both these sectors. Every resident in Ireland is entitled to healthcare through the public health system, which is managed by the HSE (HSE, 2017a).

The types of healthcare provided by the HSE include primary care and secondary or tertiary care. Primary care is usually the initial point of access or contact for individuals to the health service providers. Primary care typically consists of a wide range of healthcare professionals including general practitioners (GPs), nurses, midwives, dentists, pharmacists, physiotherapists, occupational therapists and social workers. It also includes access to

community mental health and disability services, public health nursing and preventative services such as immunisation. Secondary or tertiary care is primarily hospital based and is focused on acute care services, maternity and specialist services (DOH, 2001). Figure 2.4 illustrates the various pathways a patient may take when using the different healthcare services in Ireland.

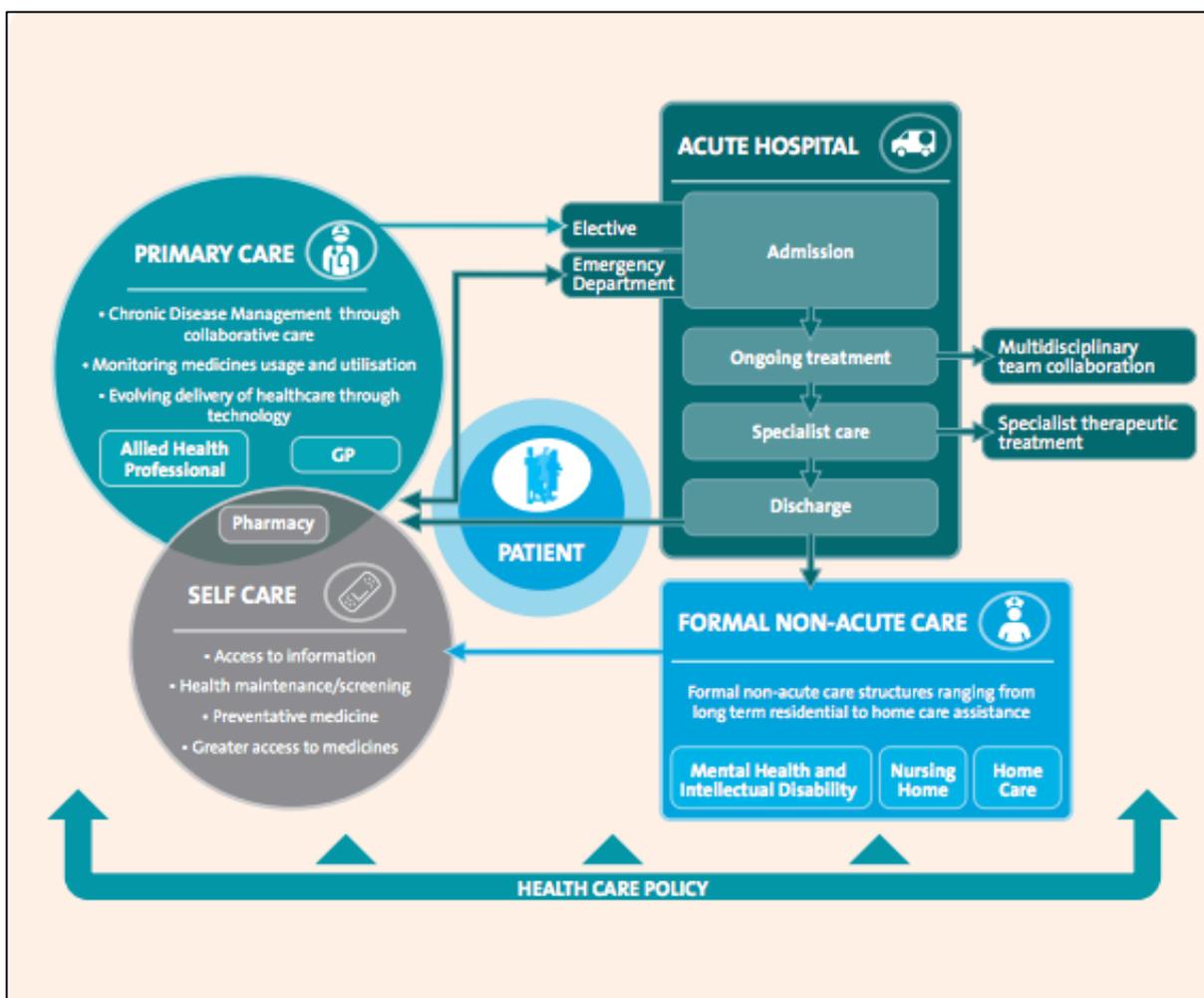


Figure 2.4: Outline of patient care journey (PSI, 2016a)

The vast majority (90-95%) of healthcare needs can be addressed in the primary care setting (DOH, 2001) and it has been demonstrated that robust primary care systems have led to improved health outcomes in the community (Macinko et al., 2003). Multidisciplinary primary care teams (PCTs) have been established to facilitate the delivery of healthcare as close as possible to people’s homes whilst providing an access point to local health and social care services. The ambition of the Irish government is to support people to stay in their own homes and communities for as long as possible (HSE, 2017c). This is echoed in the Department of

Health's Statement of Strategy 2016 – 2019 report which states “*The ongoing challenge is to develop a model of care which is more integrated and continuous, person-centred, and delivered at the lowest level of complexity consistent with patient safety*” with a commitment “*to a decisive shift towards Primary Care in the delivery of health services in Ireland*” (DOH, 2016).

Ireland is now beginning to catch up with other European countries in terms of population ageing (PSI, 2016b) with people in Ireland living longer than previous generations. By 2041 there will be an estimated 1.3 million to 1.4 million people aged over 65 years, representing 20-25% of the total Irish population with the greatest increases expected to be in the over-80 year age group, where numbers are expected to increase four-fold (CARDI, 2012). As the population ages, the increasing prevalence of chronic disease and complex medical conditions will have profound implications on the health system. Experts have estimated that before 2030 chronic diseases will account for 70% of the global disease burden and will be responsible for 80% of deaths across the world (Nuño et al., 2012). It is already estimated that approximately 38% of Irish people over 50 years have one chronic disease and 11% have more than one (DOH, 2016). The current health system must adapt to cope with the burden of chronic diseases coupled with an ageing population. The government's ambition of a “*decisive shift*” towards primary care has never been more important than it is now.

The CODEIRE study estimated that the total annual cost of managing Type 2 diabetes in Ireland was €377.2 million, this figure rising to €580.2 million for both diagnosed and undiagnosed Type 2 diabetes. These figures corresponded to 4.1% and 6.4% of total healthcare expenditure respectively (Nolan et al., 2006). It is evident that the approach to chronic diseases needed is an integrated one, again emphasising the crucial need to utilise the resources of primary care to their full potential. Pharmacists are the most accessible primary care service providers with 85 million individual visits made to pharmacies every year (PSI, 2016a). A systematic review has shown that interventions led by community pharmacists for patients with hypertension can significantly reduce both systolic and diastolic blood pressure (Cheema et al., 2014). Some of the interventions included: hypertension education, advice on lifestyle and medication adherence. It has also been demonstrated that when pharmacists are involved in multidisciplinary PCTs, there are improved compliance rates with medicines, improved patient outcomes, enhanced patient engagement and reduced medical costs (Salvo et al., 2012).

Convincing international evidence has shown that expanding the scope of the services provided by community pharmacists will reduce pressure on the Irish health service (IPU, 2015).

## 2.4 eHealth

*“eHealth involves the integration of all information and knowledge sources involved in the delivery of healthcare via information technology based systems.”* (HSE, 2015).

In 2013, an eHealth Strategy for Ireland was published with eHealth Ireland having identified a national electronic health record (EHR) as a key capability requirement for the future delivery of healthcare in Ireland (eHealth Ireland, 2015). This was echoed by the Minister for Health, Simon Harris, in 2016 who identified that an essential tool in the modernisation of health service delivery in Ireland is information technology. It is recognised as a crucial and fundamental tool in enabling the connection required amongst healthcare professionals, service users and organisations to achieve integrated care (DOH, 2016).

An extract from eHealth Ireland’s Knowledge and Information Strategy comments that technology *“allows individuals to better manage their own health and become active participants in planning for their own needs. In short, connected health is better health”* (eHealth Ireland, 2015). Connected health is used as an umbrella term to include terms such as Telemedicine, eHealth, Digital Health, mHealth and Telehealth. Connected health seeks to improve patient outcomes by connecting people and technology and linking them with their doctor, nurse, pharmacist and other health professionals as appropriate. These improved patient outcomes can be measured by increased home-based care, decreased hospital readmissions, better communication between providers of shared care and increased access for patients to their health information (Connected Health, 2016). The Knowledge & Information strategy outlines how enabling technology and using information that is integrated can support the *“delivery of innovative, safe and high quality patient care to meet the needs of our population across all patient pathways and care settings”* (HSE, 2015).

As mentioned previously, Ireland’s healthcare needs are changing. This is primarily due to an ageing population, the complexity of healthcare services required and the rise of chronic diseases. The current health system will have to adapt to cope with the burden of chronic diseases in a health system that is already strained and to do so must embrace eHealth

technologies as possible solutions. All this must be achieved in a country where the national health ICT (Information and Communication Technology) spend (0.85% of the total healthcare budget) is significantly below that of our European counterparts (2-3%) (HSE, 2015).

Digitisation is defined as *“the conversion of text, pictures, or sound into a digital form that can be processed by a computer”* (Oxford Dictionaries, 2017). It has been shown that patient safety is increased and efficiencies are improved because of digitisation. Computerised Physician Order Entry or CPOE systems can be used to highlight this point. CPOE systems are often suggested as having a role to play in the reduction of medication errors (Koppel et al., 2005, Bates et al., 1998, Bates, 2001). In addition, systematic reviews completed by Kaushal, Kuperman and Papshev all concluded in their findings that the use of CPOE significantly decreases medication error rates (Kaushal et al., 2003, Kuperman and Gibson, 2003, Papshev and Peterson, 2001). In terms of quantifying this effect Ammenwerth et al., performed both a systematic and quantitative review to establish the effect of CPOE on medication errors and adverse drug events (ADEs). In this review, twenty-three out of twenty-five studies showed a significant relative risk reduction of 13% to 99% on the medication error rate. Also, analysed in this systematic review were the effects of CPOE on potential and actual ADEs. The results showed a relative risk reduction of 35% to 98% in potential ADEs and 30% to 84% reduction in actual ADEs, concluding that CPOE can decrease the risk for ADEs and medication errors (Ammenwerth et al., 2008).

Systems that are paper-based have often led to *“inaccurate, incomplete, untimely, fragmented, duplicative, and poorly documented”* information (Pierre, 2004), with audits of paper records revealing significant amounts of incomplete patient records (Young et al., 1998, Hippisley-Cox et al., 2003, Carroll et al., 2003, Hogan and Wagner, 1997). Moving from a paper-based system to an electronic system for healthcare records has many potential benefits in terms of accuracy and completeness of records with Tsai et al. demonstrating that when compared to paper records electronic medical records were 40% more complete (Tsai and Bond, 2008). It is also important to note that paper-based records do not lend themselves to convenient audit and research activities. Benefits of digitisation will be further explored in section 2.10.

It is essential that digitisation is completed using medical terminologies like SNOMED CT (Clinical Terms) which will enrich the data, reduce variance and will support the exchange of health information. Adoption of SNOMED CT as the national clinical terminology for Ireland

took a step forward when the Office of the CIO of the HSE (in conjunction with the Department of Health) announced that they had become a member of SNOMED International (eHealth Ireland, 2017d). Using an internationally recognised robust classification standard such as SNOMED CT for healthcare in Ireland represents a real step in the right direction in supporting and implementing the national eHealth Strategy.

Digitisation of pharmacy needs to be a key deliverable to achieve the proposed initiatives in eHealth Ireland's ePharmacy programme. The ambition of the ePharmacy programme is to use digital solutions to create a digital platform for the delivery of pharmacy services in Ireland that are safer and more efficient. Data availability across healthcare settings and data analytics for pharmacy are key focuses for the ePharmacy programme (eHealth Ireland, 2017a).

## 2.5 Pharmacy in Ireland

As of June 2017, there were 1,909 registered community pharmacies (PSI, 2017) and 5,636 registered pharmacists in Ireland (PSI, 2016a) with an average person visiting a community pharmacy 19 times a year (IPU, 2017). Ireland's number of pharmacists (per 10,000 population) is the second highest compared to other countries at 11.84. Only Australia is higher at 12.56. It compares to other countries such as Canada at 11, New Zealand at 7.6 and the UK and the US at 7.85 and 9.12 respectively. At 3.06 the Netherlands was the lowest of the selected countries analysed (PSI, 2016b). Despite having a relatively high number of pharmacies, Ireland's pharmacist per community pharmacy ratio is low at 2.9 per pharmacy compared with other countries such as Australia (5.3) USA (4.3) and Canada (3.9) but is on a par with New Zealand. Despite this, approximately 2 million people visit a community pharmacy in Ireland every month (PSI, 2016d) with 20 million prescriptions being dispensed annually. The Future Pharmacy Practice in Ireland – Meeting Patients' Needs report also reported that Ireland has a particularly young pharmacy profession with over 70% being under the age of 45 (PSI, 2016a). Research of the profession has also shown that approximately 10% of registered pharmacists work in hospital pharmacy in Ireland. This compares to 11% in New Zealand, 15% in Canada, 15-20% in Australia, 21% in the UK and 24% in the USA (PSI, 2016b).

The pharmacy profession in Ireland has undergone significant changes in recent years, notably with the introduction of the Pharmacy Act in 2007 which established a modern regulatory framework for the profession. There have also been significant developments in the practice of pharmacy in recent years some of which include the provision of new clinical services such as

seasonal influenza, herpes zoster (shingles) and pneumococcal vaccinations (Medicinal Products (Prescription and Control of Supply) (Amendment No.2) Regulations 2015, 2015). Patients can now avail of emergency hormonal contraception directly from their pharmacists and new legislation introduced in 2015 allows pharmacists (who have completed the necessary training), to administer certain medicines “*for the purpose of saving life or reducing severe distress in emergency situations*”. An example of such a medicine is adrenaline (PSI, 2015). The ability of pharmacists to successfully deliver services such as the influenza vaccination, smoking cessation services and the emergency hormonal contraception service has demonstrated the important role that pharmacists have in the provision of direct healthcare to patients.

It is also important to highlight that an expansion in the role of pharmacists is welcomed by patients with 91% agreeing they would like their blood pressure taken by a pharmacist. 94% of patients would like pharmacists to treat minor ailments and would also like pharmacists to offer advice on medication management. Although GPs are still seen as a significant source of advice for patients, it is important to note that 57% of patients have reported that they would speak to their pharmacist before their GP (primarily due to the cost of attending the GP) (PSI, 2016a). This is also evident by the fact that patients are visiting pharmacies with two to three times the frequency of the GP, which again highlights the fact that pharmacists and pharmacies have a crucial role in the provision of healthcare to patients and remain a very important aspect of the Irish healthcare system (PSI, 2016d).

## 2.6 Clinical Pharmacy Services

In addition to dispensing prescriptions and supervising the sale and supply of non-prescription medicines, a wide range of clinical services are now offered by many community pharmacies. Clinical services can help to detect certain medical conditions at an early stage; for example, the ambulatory blood pressure monitoring service (ABPM) can help detect high blood pressure (hypertension). Early and accurate identification and management of hypertension is important to promote a person's long term health and pharmacists offering this service can help patients to better manage their condition. Clinical pharmacy services are also essential for supporting the strong working relationships between pharmacists and GPs, a relationship which is extremely important and supports both professions' core aims of promoting and safeguarding the wellbeing of their patients.

The ability of pharmacists to conduct clinical pharmacy services was facilitated through the introduction of legislation in 2010, which meant that all pharmacies must have a designated patient consultation area (Regulation of Retail Pharmacy Businesses Regulations 2008 (S.I. 488 of 2008)). This regulation has enabled pharmacists to provide more direct care to patients, provides a private consultation area for patients to discuss their medicines with their pharmacist and has facilitated pharmacists to provide clinical pharmacy services such as vaccination services, emergency hormonal contraceptive services and ambulatory blood pressure monitoring to patients.

In Ireland, 907 pharmacies provided flu vaccination services to over 40,115 patients during the 2013/14 season, where 24% of those patients had never been vaccinated before and 85% of those were in an at-risk group (e.g. persons aged 65 and over, persons with long-term health conditions such as chronic heart disease, chronic respiratory disease, pregnant women) (HSE, 2017e, IPU, 2014a). During the 2014/15 season, the number of patients vaccinated in Irish pharmacies increased to 53,047, where 23% of people vaccinated in pharmacy had never been vaccinated before and 83% of those were in an at-risk group. Pharmacists vaccination accounts for approximately 10% of the total population immunisation (PSI, 2016a). This demonstrates the capability of pharmacists to play a key role in implementation of national preventive health programmes. With 85 million individual visits made to pharmacies every year (IPU, 2014b) pharmacists are ideally placed as the most accessible healthcare provider to support the government's ambition to deliver the majority of healthcare needs through primary care. Numerous studies have shown the impact of community pharmacy in improving patient outcomes. One such study (Rothman et al., 2005) examined the impact of pharmacy led support for hypertensive and diabetic patients in a randomised trial. The results of the study demonstrated significant reductions in blood pressure and improvements in glycaemic control for intervention patients compared to patients in the control group. Secondary outcomes of this study also revealed that patients who were in the intervention group showed more improvements in their diabetic knowledge and were more satisfied with their treatment when compared with control patients.

The expanded role of pharmacists in the delivery of clinical services is evident internationally. 40% of all sold influenza vaccines in Portugal are administered in community pharmacies (International Pharmaceutical Federation, 2016). Australian pharmacists, in addition to the

influenza vaccine, deliver the measles and whooping cough vaccines with most community pharmacists in the US providing the influenza and single point travel vaccines (PSI, 2016b). Studies have shown that US vaccination rates for young adults have more than doubled in the ten years after the implementation of a pharmacy-based vaccination service (International Pharmaceutical Federation, 2016). Vaccination services in New Zealand include E.coli, cholera, Tdap (combination vaccine that protects against tetanus, diphtheria and pertussis (CDC, 2017)) meningococcal, varicella zoster virus and influenza (New Zealand Medical and Medical Device Safety Authority (Medsafe), 2016). Examples of clinical services provided by UK Pharmacists include: chlamydia screening and treatment, H. pylori detection test and vaccinations services (PSI, 2016b). A community pharmacy chain the UK recently extended its private human papillomavirus (HPV) vaccination service to make it available to boys and men aged 12–44 years (The Pharmaceutical Journal, 2017). Certain community pharmacies in the UK are involved in providing needle and syringe programmes (NSP). As part of this programme, vaccinations for blood borne diseases may be administered; these include: Hepatitis B, Hepatitis C, HIV and Syphilis (PSNC, 2016).

## 2.7 Health Records

A health record or healthcare record can be defined as: *“A record that refers to all information collected, processed and held in both manual and electronic formats pertaining to the service user and service user care. It includes demographics, clinical data, images, unique identification, investigation, samples, correspondence and communications relating to the service user and his/her care”* (HSE, 2011). Healthcare professionals such as GPs, pharmacists and nurses have kept paper-based records for recording patient care activities such as clinical services for decades. Records of patient care are essential to ensure the safety, quality, consistency and continuity of care and it is recognised that good record keeping supports patient safety, evidence-based healthcare, continuity of care, and good professional practice in healthcare (Goundrey-Smith, 2012). Many individuals have numerous health records, for example with their GP, hospital, pharmacy and dentist. Healthcare records, if required, may also facilitate a healthcare professional to respond to any questions or queries that might arise subsequently about the medication or care a patient has received. Electronic systems for recording patient care have emerged over the last number of decades for use in healthcare settings (Goundrey-Smith, 2012).

Patient medication records or PMRs are one such system that are used by community pharmacists to store (primarily) all relevant dispensing data for patients. The legal requirement for printed medicine labels became the impetus for the development and adoption of PMRs in community pharmacy. PMRs were introduced into UK hospitals in the late 1970s and rolled out into community pharmacies subsequently (Goundrey-Smith, 2012). Although pharmacists have been maintaining PMRs for in excess of thirty years, the recording of patient care activities such as clinical services has not been incorporated into the PMR and has remained predominantly a paper-based activity to date.

As previously discussed, the role of the community pharmacist is continually expanding, with pharmacists increasingly developing new clinical services to support patients and the health service. As a result, there is a pressing need for community pharmacists to electronically record details of clinical services provided. Moving from a paper-based system for recording consultations to an electronic format for clinical services in pharmacy has many potential benefits which will be further discussed in section 2.10.

## 2.8 Clinical Pharmacy Service Records

Clinical pharmacy service consultation records in Ireland, such as for the winter flu vaccination service (Appendix A), are currently recorded on paper-based forms. In other jurisdictions, such as in England for the NHS, there are systems that are currently in use for electronically recording clinical pharmacy services. Some UK providers include PharmOutcomes, Sonar, North 51 and Webstar. A description of electronic systems currently used for recording pharmacy services in the UK and Ireland will be described in chapter 5. Table 2.1 below is an example of the variance of paper and/or electronic records used for vaccination records by country. This table also shows that Ireland captures vaccination records both electronically and on paper-based forms, details of which will be discussed further in chapter 5.

Table 2.1: Vaccination Record Format by Country (International Pharmaceutical Federation, 2016)

Country	Vaccination Record Format
<b>Argentina</b>	Paper
<b>Australia</b>	Electronic and paper
<b>Belgium</b>	Electronic
<b>France</b>	Electronic
<b>Ireland</b>	Electronic and paper
<b>Philippines</b>	Records for vaccinations have not yet been decided
<b>Portugal</b>	Electronic or paper
<b>South Africa</b>	Electronic and/or paper
<b>Switzerland</b>	Electronic and/or paper
<b>United Kingdom</b>	Paper and Pharmacy Electronic System
<b>USA</b>	Electronic and paper

As mentioned earlier, clinical pharmacy service consultation records in Ireland, are predominantly recorded on paper-based forms. Where records of services are recorded on paper forms there is a need to design and print the paper forms for use in store. These paper-based records are then retained as paper records post consultation. For example, all records relating to the administration of vaccines must be kept at the pharmacy premises where the vaccine was administered for two years and must also be preserved for at least eight years by the pharmacy owner (PSI, 2016c). The continuous supply of required consultation forms can be problematic and amending of consultation forms for any reason (e.g. clinical update) can be both costly and time consuming.

Clinical pharmacy services such as the influenza, pneumococcal and shingles vaccination services, the emergency hormonal contraceptive service, the ambulatory blood pressure monitoring service and the pharmacy Strep A (*Streptococcus A*) testing service contain a wealth of healthcare data that is currently ‘locked’ into paper-based clinical service records. Digitising these clinical records has the potential to ‘unlock’ these rich datasets which can be utilised, for example by the Department of Health and the HSE in the planning, provision and measurement of pharmacy based services. An analysis of data that is captured currently in community pharmacies and the potential value of this data being digitised will be demonstrated in chapter 4.

## 2.9 Paper Records versus Electronic Records

*“The medical record is an abomination. It is a disgrace to the profession that created it. More often than not, the chart is thick, tattered, disorganized, and illegible; progress notes, consultant’s notes, radiology reports, and nurses’ notes are all co-mingled in accession sequence. The charts confuse rather than enlighten; they provide a forbidding challenge to anyone who tries to understand what is happening to a patient”* (Bleich, 1993). Twenty years on, paper records are still widely acknowledged as being unfit for purpose, they can only be used by one person at a time, are difficult to find, disorganised and inconsistent (Benson, 2016).

Paper records have been heavily criticised for their limited accessibility and their “*general incompleteness*” and it has been noted that the information from paper-based records can be vague, illegible, ambiguous and hard to extract (Berg, 2003). Audits of paper records have revealed significant amounts of incomplete patient records (Young et al., 1998, Hippisley-Cox et al., 2003, Carroll et al., 2003, Hogan and Wagner, 1997), with Tsai et al. demonstrating that when compared to paper records electronic medical records were 40% more complete (Tsai and Bond, 2008). This study also cited that increased user communication, fewer medical errors, cost savings and reduced paperwork as potential benefits of electronic records. Table 2.2 is an example of the types of missing information and their frequency from paper based records (Hoyt, 2014).

Table 2.2: The types of missing information and its frequency

Information Missing During Patient Visits	% Visits
Lab results	45%
Radiology results	28%
History and physical exams	27%
Letters/dictations	39%
Pathology results	15%

A 2011 study compared two hospitals (evenly matched in term of size and clinical mix), one hospital used a paper-based discharge summary which was posted to GPs, the second hospital used an electronic discharge summary. The results from this study showed that only 39% of GPs received the completed paper-based summaries compared to 82% of GPs receiving the electronic discharge summary (Forsythe et al., 2011). There was a satisfaction rate of 93%

amongst the GPs receiving the electronic discharge summary compared to 7% of GPs who received the paper-based summaries via the post. An additional study compared documentation in paper-based forms versus electronic records and found that the electronic records improved both quality and timeliness of nursing notes (Rinkus and Chitwood, 2002).

## 2.10 Benefits of Digitising Clinical Service Records in Community Pharmacy

Studies have shown that electronic health records have the potential to support healthcare professionals in the delivery of pharmaceutical care. Some of these benefits may include:

- It is possible that electronic health records may be more secure than paper-based records depending on the design of the system (Goundrey-Smith, 2012).
- The ability to have records with structured content may support the workflow process for healthcare professionals. Cohorts of patients may be systematically identified using the structured data within electronic records. These interventions may lead to positive population health benefits (Goundrey-Smith, 2012). One such study demonstrated that EHRs could be used to identify inappropriate prescribing (Buck et al., 2009). EHRs have also been shown as useful tools to screen for medication-related problems (Roten et al., 2009).
- The availability of the patient record in an electronic format means that decision support tools which are electronic may be made available which may support the delivery of healthcare services. Numerous completed systematic reviews all concluded that the use of CPOE significantly decreases medication error rates (Kaushal et al., 2003, Kuperman and Gibson, 2003, Papshev and Peterson, 2001) which is a key benefit of electronic health records.
- The information in electronic patient records is legible, reducing errors and increasing quality of care. Studies have identified poor handwriting (Al-Arifi, 2014) and handwritten prescriptions have been shown as a major cause of dispensing errors (Knudsen et al., 2007).
- Electronic patient records have the potential to lead to quicker access to patient information for health professionals. EHRs may also increase efficiencies and productivity as they are paperless and therefore may streamline a number of routine tasks.
- Electronic records could improve quality of care as healthcare professionals can exchange accurate, up-to-date and thorough information about a patient in real time (Goundrey-Smith, 2012).

Electronic records of good quality can be used to prompt better patient care and coordination of care between primary and secondary care (Hippisley-Cox et al., 2003). Population health can also be monitored as EHR systems can be mined for research as they contain a vast repository of disease and treatment data and as such are rich datasets for research (Denny, 2012).

## 2.11 Challenges of Digitising Clinical Service Records in Community Pharmacy

As shown in section 2.10 there are, in theory, many potential benefits to EHRs with EHRs having the potential to improve patient safety and quality of care. The literature is limited when researching the challenges of digitising clinical service records in the community pharmacy sector specifically but the literature has many examples when the topic is applied to the broader healthcare sector. Studies have shown that approximately 75% of computerised health information systems are considered to have failed (Littlejohns et al., 2003). One study (Boockvar et al., 2010) examined the transfer of care for patients with no EHR versus patients who had an EHR found no difference in adverse drug events or medication inconsistencies.

Table 2.1 in section 2.8 showed us that Switzerland captures vaccination records in both electronic and/or paper format. These records can be shared between pharmacists, GPs and the public using a national website that enables vaccination record storage free of charge, therefore, it has the potential to contain a vast repository of records. However, it has been shown that many healthcare professionals (especially GPs) still have some concerns about the security of the electronic system (International Pharmaceutical Federation, 2016). This presents a challenge for widespread adoption (this electronic system is voluntary and therefore is not considered as a national electronic system).

Unfortunately, there are many challenges to digitising health records and the findings of studies on the clinical benefits of EHRs are mixed. Some of the challenges that are relevant to adoption of electronic health records include (Hoyt, 2014):

- Financial barriers – many studies have reported lack of funding as the number one barrier to EHR adoption.
- Resistance by healthcare professionals – Resistance or lack of support by medical staff has been cited as consistently as the second most commonly perceived barrier to adoption (second to EHR funding).

- Loss of productivity and changes to workflow – depending on ability, training, etc., the introduction of a new system may lead to a reduction in work capacity for some staff. This loss of productivity can be, in part, due to changes in workflow.
- Issues with usability – usability has been defined as the “*effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment*” (Boone, 2010).
- Reduced interaction between patients and doctors – studies have shown that doctors are spending more time completing data entry at the expense of direct time with patients (Block et al., 2013, Hill et al., 2013).
- Integration with other systems and lack of interoperability standards – many surgeries and hospitals have multiple old legacy systems that do not communicate with other which can prove problematic when trying to integrate with new EHR systems. Data standards and medical vocabularies are essential for interoperability and lack of both can present a major challenge.
- Concerns regarding privacy – there is a reasonable expectation that patient identifiable information is collected in confidence and therefore should be stored in confidence. EHRs pose new potential privacy and security threats for patient data.

Other studies have also demonstrated that difficulties with the use of EHR data include: availability of data, data that is missing or incorrect data and vast quantities of narrative text data that is unstructured (Denny, 2012).

## 2.12 Primary and Secondary Use of Data

The healthcare industry generates large volumes of data every day. It is an industry that is information-intensive, driven by record keeping, patient care, compliance and regulatory requirements (Raghupathi, 2010). Health data is primarily generated through clinical documentation in the process of direct patient care (Safran et al., 2007). This documentation may be held in paper records, electronic health records or a mixture of both. It has been reported that the US healthcare industry by 2011 had reached 150 exabytes (exabyte:  $10^{18}$  gigabytes) of data. It is predicted that, at the current rate of growth, healthcare data will soon reach the zettabyte ( $10^{21}$  gigabytes) scale and subsequently the yottabyte ( $10^{24}$  gigabytes) scale (Raghupathi and Raghupathi, 2014). In Ireland, it is estimated that up to 30% of the total health

budget may be spent one way or another on handling information, collecting it, looking for it, storing it (HIQA, 2012b).

The need for, and value of, health data for many purposes is widely recognised. In a study conducted by Price Waterhouse Coopers, more than three-quarters of the healthcare executives surveyed stated that information contained in their EHR could become their most valuable asset over the next 5 years as ‘secondary use’ of data takes of (Harper, 2013).

For the purposes of this research it is important to distinguish between primary and secondary uses of data. The primary use of data involves information being used for the purpose for which it was initially collected. Primary use of administrative data is defined as information collected and used as part of the routine day-to-day provision or management of public sector services and schemes (MacFeely and Dunne, 2014). In the case of routinely collected health data, its primary purpose is *“protecting, promoting, maintaining or meeting the physical and mental health needs of an individual”* (DOHC, 2009). Primary use of data has also been defined as *“the use of personal health record by the organization or entity that produced or acquired these data in the process of providing real-time, direct care of an individual”* (Safran et al., 2007), in other words, use of information for the purpose for which it was collected - the primary purpose.

Secondary use of health data has been defined as *“non-direct care use of personal health information including but not limited to analysis, research, quality/safety measurement, public health, payment, provider certification or accreditation, and marketing and other business including strictly commercial activities”* (Safran et al., 2007).

Table 2.3 provides examples of how health information is used for secondary purposes in Ireland:

Table 2.3: International Review of Secondary Use of Personal Health Information (HIQA, 2012b)

Secondary Use	Example
Audit and quality assurance purposes	Use of patient healthcare records to complete clinical audits in hospitals to support continuous improvement in the delivery of care.
Performance monitoring	HealthStat is a performance information and improvement system designed and implemented by the Health Service Executive (HSE). It is a databank of performance information for Irish public health services. It allows the HSE to measure, for example, waiting times for services in public hospitals throughout the country, assess if targets are being met and identify areas where improvements are required.
Service planning	Hospital In-Patient Enquiry (HIPE) data are used by the Department of Health and the HSE in the planning, provision and measurement of acute hospital services.

The healthcare industry has an increasing need for clinical data to support both patient care and data reuse. Data reuse or secondary use of data is essential for improving the safety, quality and efficiency of healthcare (Barton et al., 2011). While research is not the primary motivation for collecting this data, it often has a significant research potential if reuse is possible. As previously mentioned, EHR systems can be mined for research as they contain a vast repository of disease and treatment data and as such are rich datasets for research (Denny, 2012).

### 2.13 Conclusion

Chapter 2 presented the findings of a review of the literature on topics relating to this research. It demonstrated that digitising clinical service records in community pharmacy is a relatively new and niche area and this was verified by the limited information available from the literature specifically in relation to pharmacy. However, part of the literature review did reveal that several countries had implemented electronic records for recording clinical pharmacy services. Some of the countries identified were England, Ireland, Belgium, France, Portugal and the USA.

Chapter 3 describes the research methodology used to answer the research questions and assesses the limitations of the methodology used.

## Chapter 3. Methodology

### 3.1 Introduction

Chapter 2 presented and reviewed the available literature in relation to the research topic. This chapter outlines the methodology used by the researcher to answer the chosen research questions and describes the approaches used. This chapter also outlines the research questions and the research aims and objectives.

### 3.2 Research Questions

*“The central question is a broad question that asks for an exploration of the central phenomenon or concept in a study.”* (Creswell, 2014)

The topic for this research is: digitising clinical service records in community pharmacy. The two research questions to be answered in the dissertation are:

- What are the potential benefits of digitising clinical service records in community pharmacy?
- What are the challenges for digitising clinical service records in community pharmacy?

### 3.3 Research Aims and Objectives

This research aims to investigate the potential benefits of digitising clinical service records in community pharmacy. The research will also seek to understand the challenges of digitising clinical service records.

This study will involve completing a comprehensive review of literature to review the various topics related to this research.

The researcher will illustrate the type of data that is currently captured on paper-based consultation records within the community pharmacy. This will endeavour to demonstrate the wealth of data that is currently ‘locked’ into community pharmacy currently and the potential value of this data being digitised.

The researcher will describe electronic recording systems that are used currently within the pharmacy sector to explore their functionality, usability and potential benefits. This description will provide insights for the design and development of an electronic recording system for clinical pharmacy service consultations within community pharmacy.

Semi-structured interviews will be conducted to gain insight into the views of participants on the benefits and challenges of digitising clinical service records in community pharmacy.

### 3.4 Researcher's Positionality

The researcher, who is a community pharmacist, strongly believes in the value of digitising clinical service records in community pharmacy. The researcher believes that there are opportunities within pharmacy for the application of technology to reduce workload (less duplication), to improve accuracy of data collection (complete and consistent) and for the ability to complete research and data-analysis. The researcher believes that pharmacies have a wealth of valuable longitudinal and observational data that currently is unused and if used for research purposes could be of enormous benefit.

### 3.5 Choice of Methodology

Research methodology has been described as the various means of data collection, analysis and interpretation employed by a researcher in endeavouring to answer their research question (Creswell, 2014). The aim of methodology, described by Kaplan, is to assist understanding of not only the outcomes of the scientific research being undertaken but also the process itself (Kaplan, 1973).

In an attempt to answer the above research questions, this dissertation comprises four distinct sections:

- Literature review
- Analysis of data that is currently captured for clinical pharmacy services and the potential value of this data being digitised.
- Description of systems currently recording clinical services electronically within community pharmacy.

- Semi-structured interviews to gain insight into the views of participants on digitising clinical service records in community pharmacy.

The methodology and the rationale for each will be outlined below.

### 3.6 Role of the Literature Review

The first part of the research involves a comprehensive review of the available literature to:

- Explore the potential benefits of digitising clinical service records in community pharmacy.
- Seek to understand the challenges for digitising clinical service records in community pharmacy.
- Gain an understanding of systems used to electronically record clinical services in community pharmacy currently.

The methods used for the literature review can be found in section 2.2 and the subsequent results of the literature review are presented from section 2.3 onwards in chapter 2.

### 3.7 Analysis of Clinical Services Data Currently Captured in Community Pharmacy

The second part of the research involves illustrating the types of data that are currently captured on paper-based consultation records within community pharmacy. This will endeavour to demonstrate the wealth of data that is currently ‘locked’ into community pharmacy. This chapter serves to describe the type of data that is captured currently and will discuss the potential value of this data being digitised. Two existing clinical pharmacy services will be examined, an Ambulatory Blood Pressure Monitoring (ABPM) service and a Pharmacy Strep A (Streptococcus) testing service. This analysis is presented in chapter 4.

### 3.8 Description of Systems Currently Recording Clinical Services Electronically Within Community pharmacy

The third part of the research involves describing electronic recording systems that are used currently within the pharmacy sector to explore their functionality, usability and potential benefits. Electronic systems that are used currently within the community pharmacy in England

and Ireland will be described. From England, the system that was chosen to describe is PharmOutcomes and from Ireland, the system that was chosen is the Primary Care Reimbursement Service (PCRS) vaccination portal. PharmOutcomes was chosen from England as it is used extensively and is often cited used as a source for community pharmacy data. The PCRS vaccination portal was chosen as the system to describe from Ireland as it is undoubtedly the most common system used in Ireland for electronically recording vaccination services. Information about both systems is widely available online. The descriptions of the above systems will provide the researcher valuable insights for the future design and development of electronic recording systems for clinical pharmacy service consultations within community pharmacy. The descriptions of these electronic systems are presented in chapter 5.

### 3.9 Semi-Structured Interviews

The final part of the primary research involves conducting semi-structured interviews with participants based on their background and interests in the research topic. The objective is to gain insight into the views of participants on the benefits and challenges of digitising clinical service records in community pharmacy. The analyses of the results of the semi-structured interviews are presented in chapter 6.

Designing interview questions to be answered by the expert participants in this topic was a concise way of finding out the relevant data required to answer the research questions as set out in chapter 1.

Semi-structured interviews were the interview format chosen by the researcher as they provide an opportunity to gain an understanding of the views and opinions of participants on digitising clinical service records in community pharmacy by exploring the research questions from the ‘real world’ of the participants (Kvale and Brinkmann, 2009). This afforded the researcher the opportunity to interpret the potential benefits and challenges for digitising clinical service records in community pharmacy. The semi-structured interview format allowed for flexibility in terms of the topics discussed, in line with the experience and background of each participant as well as the ability for exploration with follow up questions.

Semi-structured interviews provide the interviewees with the opportunity to share experiences and opinions using their own words. The researcher used descriptive and open ended questions

as these types of questions allow the participants to explain their thoughts and/or ideas (Creswell, 2014). The intention of the researcher was always to allow the participants to express themselves and explore the questions asked – the purpose of which was that the researcher benefited from the range of their experience and interpretation while, at the same, time steering their input when it waivered off subject to ensure that relevant questions were covered. The primary aim of in-depth exploratory interviews is to hear from the participants about what they think is important about the topic at hand, to gain insights into the chosen topic and to hear it in their own words.

Structured interviews were deemed unsuitable for this research by the researcher as the questions would have been restricted to a fixed list, some of which might not be relevant to the participant. Structured interviews may be perceived as impersonal, mechanistic and irrelevant for the interviewee as they must fit their experiences and feelings into the researcher's questions or categories (Cohen, 2011).

Another contributing factor for the choice of a qualitative approach for this research was based on the results of the literature review. Exploring the research questions and topics with chosen participants will potentially provide the researcher with valuable data and insight which is currently very limited in the literature.

### 3.9.1 Selection of Participants

The researcher used two types of nonprobability samples for this research: purposive samples and snowball samples. Purposive sampling was chosen as the researcher began with specific perspectives and interests in mind that she wished to examine and then sought out research participants who could address that range of perspectives. Purposive sampling is also often used when the goal of the researcher is to include participants who represent a broad range of perspectives (Blackstone, 2012). This was applicable to this research. The researcher also relied on the snowball sampling technique for this research. This involved using the expertise of initial participants to help identify and recommend additional study participants that would add value based on their background and/or interests in the chosen topic (Morgan, 2008, Blackstone, 2012).

Participants for this research were chosen for interview based on their background and/or interests in the research topic. Invited participants included representatives from HIQA, the IPU and the PCRS, pharmacists involved in the development of clinical pharmacy services in Ireland and the UK and researchers in health informatics and community pharmacy. Written informed consent was obtained from all participants recruited for interview, with all participants receiving a copy of the participant information sheet. The informed consent form and the participant information sheet for prospective participants can be found in Appendix B and C respectively.

### 3.9.2 Interview Questions

As mentioned previously, participants for this research were chosen for interview based on their background and/or interests in the research topic. The interviews were comprised of structured questions which differed depending on the experience and background of the participant. The interview questions for the participants are shown below:

The questions that were formulated for the participants who have an interest in health research were as follows:

1. *How important do you think it is to collect and use the data contained within clinical pharmacy services?*
2. *Would you personally be interested in using clinical services data that is generated in community pharmacy?*
3. *How beneficial do you think this data would be from a research perspective?*
4. *What would you consider would be the main challenges in collecting data from community pharmacy?*
5. *Are you aware of clinical pharmacy data being collected for secondary use in Ireland already or elsewhere? If so, could you elaborate?*

The questions that were formulated for participants who are currently involved in systems that record clinical pharmacy services electronically were as follows:

1. *What is your opinion on electronic clinical pharmacy service records? Do you think it would be beneficial to digitise clinical pharmacy service records?*

2. *What were your drivers for undertaking a project that recorded clinical pharmacy services electronically?*
3. *Did you come across any unexpected benefits following completion of the project?*
4. *What were the challenges or barriers to completing this project?*
5. *How were the user requirements decided for the electronic record? Who was involved?*

The questions that were formulated for participants who have an interest in informatics and pharmacy and who are key stakeholders within the pharmacy sector in Ireland were as follows:

1. *How important do you think it is to collect and use the data from clinical pharmacy services?*
2. *What is your opinion on electronic clinical pharmacy service records? Do you think it would be beneficial to digitise clinical pharmacy service records?*
3. *What has been or would be your approach for the design and development of a platform to electronically record clinical pharmacy services for community pharmacy in Ireland?*
4. *What do you see as the main challenges for digitising clinical pharmacy service records?*
5. *Are you familiar with systems for recording clinical pharmacy service records currently or potentially in any other jurisdictions? If so, what are your thoughts on these systems?*

Follow up questions may be asked as a result of the responses received to the above questions.

### 3.9.3 Research Ethics Approval

Ethics approval was sought prior to commencement of the research and was received from the School of Computer Science & Statistics, University of Dublin, Trinity College, in April 2017. This approval is included as Appendix D.

### 3.9.4 Data Collection and Analysis

Interviews were conducted with each participant by the researcher. Eight people were invited to participate and eight accepted with participants being interviewed from April to May 2017. The interviews were detailed and thorough lasting on average 40 to 50 minutes. The number of participants was considered adequate for the amount of relevant information generated and the level of discussion and exploration at interview (Rudestam and Newton, 2007). Handwritten notes were taken at all interviews in addition to all interviews being recorded with the

interviewees' permission. The researcher created a transcript for each interview, based on the interview notes and the interview recordings. A list of topics was identified through iterative reading of the transcripts and listening to the recorded files to focus the analysis. Themes and sub-themes were then identified from analysis of the coded information and based on the findings of the literature review. The themes and sub-themes are presented in section 6.3. The steps for data collection and analysis are outlined in figure 3.1 below.

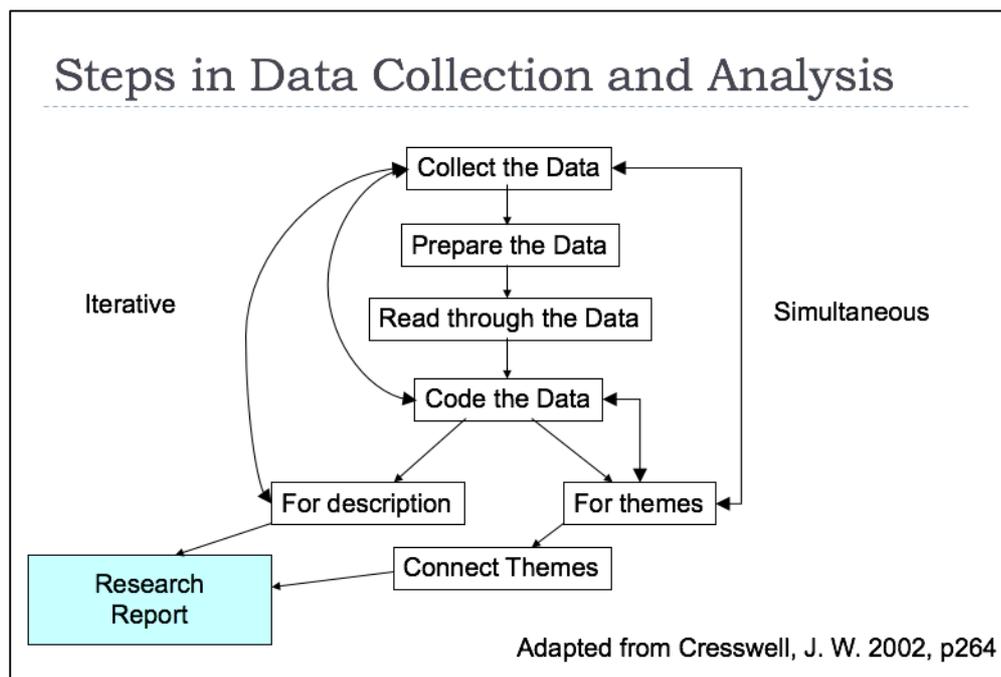


Figure 3.1: Steps in Interview Data Collection and Analysis

### 3.9.5 Interview Data Management

With permission from the participants all the interviews were recorded, field notes were also made and were then transcribed to text accordingly. The audio recordings were deleted once transcribed. Only the researcher and research supervisor had access to the data. In accordance with the Data Protection Act of 1988 (Data Protection Commissioner of Ireland, 2008), the data is stored and processed on a password protected PC and will be retained for a period of 5 years until destroyed.

### 3.10 Limitations of the Research Methodology

Part of this research used a qualitative approach to explore the proposed research questions through semi-structured interviews and other analyses as described in this chapter. With respect

to the semi-structured interviews, the participants were selected by the researcher based on their background and/or interests in the chosen topics. Although semi-structured interviews provided an extensive and in-depth analysis and exploration of the chosen topic it did not allow for quantification of the findings. Analysis of qualitative data is almost inevitably interpretative; hence the data analysis is less a completely accurate representation (compared to quantitative), it is more of a reflective, reactive interaction between the participant and the researcher. Using a quantitative approach mixed with a qualitative approach would have provided a more rounded approach to the research. A qualitative approach may mean that the researcher may be selective in their focus or the research may be influenced by the subjective features of the researcher (Cohen, 2011). It should be noted also that the author is a pharmacist, who strongly believes in the value of digitising clinical service records in community pharmacy. Therefore, there may be a possibility for some bias due to the researcher's positionality on the subject which the reader may wish to take into consideration.

### 3.11 Conclusion

There are many potential benefits and challenges to digitising clinical service records in community pharmacy, making it a complex phenomenon suitable for research in a real-life context. A qualitative method was used for this research which involved semi-structured interviews, in addition to the literature review and other analyses to provide direction for the research design and to answer the research objectives as set out in chapter 1.

The methods and findings of the literature review were presented in chapter 2. Chapter 4 will illustrate the types of data that are currently captured on paper-based consultation records within community pharmacy and the potential value of digitising this data. Chapter 5 will describe two systems that are used currently within the pharmacy sector for recording clinical pharmacy services to explore their functionality, usability and potential benefits. Chapter 6 presents the results of the semi-structured interviews, with chapter 7 concluding the dissertation.

## Chapter 4. Clinical Services Data in Community Pharmacy

### 4.1 Introduction

This chapter will endeavour to illustrate the wealth of data that is currently ‘locked’ into paper-based consultation records within the community pharmacy. It will serve to describe the type of data that is captured currently and discuss the potential value of this data being digitised. Two existing clinical pharmacy services will be analysed, an Ambulatory Blood Pressure Monitoring (ABPM) service and a Pharmacy Strep A (Streptococcus) testing service as provided in a chain of 83 community pharmacies in Ireland.

### 4.2 Ambulatory Blood Pressure Monitoring (ABPM)

#### 4.2.1 Introduction

Detection and management of raised blood pressure (hypertension) and atrial fibrillation are important factors which contribute to the prevention of stroke (DOHC, 2010). Hypertension is a major risk factor for stroke (both ischaemic and haemorrhagic), heart failure, chronic kidney disease, cognitive decline, myocardial infarction and premature death (NICE, 2016). It is estimated that 950,000 (62.2%) of adults aged 45+ in Ireland have high blood pressure (Institute of Public Health, 2012). Of these almost 595,000 are undiagnosed (DOHC, 2010). Atrial fibrillation, which is the most common type of heart rhythm disturbance, is estimated to affect at least 1% of the population at the age of 60 years and 5% at the age of 70 years (Irish Heart Foundation, 2017) and many cases remain undetected or untreated (DOHC, 2010).

It follows therefore, that early and accurate identification and management optimisation of high blood pressure is important to promote a person's long term health. One such method for achieving this is through 24-hour or ambulatory blood pressure monitoring, a procedure that is easily provided through a primary care setting such as community pharmacy.

#### 4.2.2 What is the ABPM service?

The ABPM service is where a patient is fitted with a blood pressure monitoring device which records blood pressure over a 24-hour period. Repeated measurements taken at set intervals

(usually every 30 minutes) provide a profile of blood pressure fluctuations over an entire day giving information on both daytime and, importantly, night-time blood pressure patterns, thus providing a comprehensive overview of their blood pressure profile (O'Brien, 2011). Information obtained over the 24-hour period supports the diagnostic process and can help inform practitioners as to the presence or absence of hypertension in their patients. Additionally, information on the type of hypertension present (if any) and the ability of medication to adequately control it can also be obtained.

The ABPM monitor used in the pharmacy setting where the research was conducted is the Microlife Watch BP03 AFib device. The device is validated according to the European Society of Hypertension International Protocol (ESH-IP) 2002 for the 24-hour measurement of blood pressure (Dabl Educational Trust, 2014). This device has the added unique feature of being able to opportunistically detect the presence of atrial fibrillation in patients undergoing a 24-hour blood pressure monitoring assessment. Measurements from the device are downloaded when the patient returns after 24 hours and a report of their blood pressure profile over the previous 24 hours is computer generated, a sample of which is provided in Appendix E.

#### 4.2.3 ABPM Patient Journey

When a patient arrives for their ABPM appointment they are requested fill in their personal details in the '*Part 1: Patient Information*' (figure 4.1) section of the consultation record (Appendix F). They may also choose to complete Part 2 but these questions (along with the questions from part 1) will also be checked and validated by the healthcare advisor with the patient in the consultation room.

**Patient Record Form**  
 To be retained by the store and filed securely

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**Part 1: Patient information**

First name:  Surname:

Address:

Email:

Phone no:  Date of birth:

Doctor's name:

Contact details:

Male:  Female:  Are you pregnant? Yes  No

Ethnic origin: White  Asian (India, Pakistan, Bangladesh or Sri Lanka)  Other Asian

Black African  Black Caribbean  Other Black  Mixed

Other (please specify)

I am happy to be contacted by phone: Yes  No

I give permission for the results of my blood pressure monitoring and any recommendations to be provided to my Doctor: Yes  No

**Please answer the following questions**

Are you aged 18 years or over? (You must be aged 18 or over to use this service) Yes  No

Have you had a 24-hour blood pressure measurement taken before? Yes  No

If yes, please detail:

Do you have any of the following? (Please tick one or more as relevant)

Medical Card  Doctor Visit Card  Health Amendment Card

Long Term Illness book  Private Health Insurance

Figure 4.1: 'Part 1: Patient Information' section of the ABPM record

As the patient completes Part 1 of the consultation record, the healthcare advisor programmes the ABPM device on the dispensary computer. Before the device is fitted for 24 hours, the patient's blood pressure is measured (with the same device) on both arms to check for variance. These measurements are recorded in Part 2 of the consultation record in the 'Pharmacy use only' section (figure 4.2).

**For Pharmacy use only**

**Part 1:**  
 ABPM device connected by: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 Patient reference: \_\_\_\_\_  
 Battery change complete: Yes  No  Monitor ID: \_\_\_\_\_  
 Nigh-time hours: \_\_\_\_\_ pm \_\_\_\_\_ am Daytime recording interval: \_\_\_\_\_ mins  
 Nigh-time recording interval: \_\_\_\_\_ mins

**Part 2:**  
 Height: \_\_\_\_\_ m Weight: \_\_\_\_\_ Kg BMI: \_\_\_\_\_ Kg/m<sup>2</sup>  
 Arm circumference: \_\_\_\_\_ cm BP reading right arm: \_\_\_\_\_ mmHg  
 BP reading left arm: \_\_\_\_\_ mmHg Date fitted: \_\_\_\_/\_\_\_\_/\_\_\_\_  
 Right arm: \_\_\_\_\_ Left arm: \_\_\_\_\_ Time on: \_\_\_\_\_  
 Requested by: \_\_\_\_\_

**Results consultation**  
 Date returned and results consultation: \_\_\_\_\_  
 Pharmacist name: \_\_\_\_\_  
 Signature: \_\_\_\_\_

Figure 4.2: BP recording section for right and left arm

The cuff should then remain on the patient's non-dominant arm. The device is set to measure at 30 minute intervals throughout both the day and night.

24-hours after the fitting consultation the patient will return to the pharmacy and the device is returned, the readings from the device are downloaded and an electronic results report (Appendix E) is generated based on readings over the previous 24-hours. Three copies of this report are printed in colour, one for storing with the paper consultation record and two to give to the patient, one for their own records and one to give to their GP. The pharmacist then interprets and discusses the results with the patient.

#### 4.2.4 ABPM Data

Data is generated in two ways from this service, namely data from the paper-based consultation record and from the electronic report that is generated when the ABPM device is downloaded (24-hours later). The data from both sources will be analysed separately below.

As part of another research project, a subset of consultation forms was chosen from consultations performed between 2014 and 2016 and this data was made available for the researcher in this study. Data was collated on a total of n=583 patients across 21 pharmacy locations. The patient records were then anonymised prior to sharing with the researcher for this dissertation. Anonymisation involved the removal of details such as: patient name, address, date of birth, GP details and contact information. This anonymisation was completed by a

different researcher who is using the data for a separate research project. It is used in this study for secondary analysis with a view to assessing the quantity and quality of data recorded. The researcher was also provided with a pre-coded Excel spreadsheet for the data which facilitated the researcher in completing accurate data analysis. Descriptive statistics were used by the researcher to report demographic data, with the results presented as absolute numbers and percentages.

#### 4.2.4.1 ABPM Data from the Paper-based Consultation Record

Patients who avail of the ABPM service undergo a service consultation where data relating to their demographic characteristics, reasons for availing of 24-hour blood pressure measurement, past medical history and cardiovascular risk factors are collected. The data from the paper-based consultation record is self-reported by the patient.

Past medical history data includes the following information (figure 4.3) below:

- **Smoking:** Do you smoke, or have you ever smoked? If yes, how many cigarettes each day? How long have you been a smoker (no. of years)? Do you currently smoke?
- **Alcohol:** How much alcohol on average do you drink per week? Number of standard drinks per week? Don't drink?
- **Medication:** Do you take any medication? Yes/No.
- **Diabetic:** Do you have diabetes? Yes/No, if yes, please select which type: Type 1 or Type 2.

**Part 2: Patient information**

Do you smoke, or have you ever smoked? Yes  No

If yes, how many cigarettes each day?

How long have you been a smoker (no. of years)?

Do you currently smoke? Yes  No

How much alcohol on average do you drink per week:  
(One standard drink is approximately equal to half a pint of normal beer/lager/ale OR one small glass of wine OR one single measure of spirits)

Number of standard drinks per week    Don't drink

Do you take any medication? Yes  No  If yes please detail:

Do you have diabetes? Yes  No

If yes, please select which type: Type 1  or Type 2

Figure 4.3: 'Part 2: patient information' section of the consultation record

Data pertaining to cardiovascular risk factors includes (figure 4.4) below:

- **Cholesterol:** Do you have high cholesterol? Yes/No.
- **Cardiovascular:** Ischaemic Stroke, TIA-Trans Ischaemic Attack (mini stroke), Haemorrhagic Stroke, Heart Attack, Atrial Fibrillation, Heart Failure, Vascular disease, Unsure.

**Part 2: Patient information continued**

Do you have high cholesterol? Yes  No  Unsure

Have you ever had any of the following: (Please tick one or more as relevant)

Ischaemic Stroke  TIA-Trans Ischaemic Attack (mini stroke)

Haemorrhagic Stroke  Heart Attack  Unsure

Have you ever been diagnosed with any of the following: (Please tick one or more as relevant)

Atrial Fibrillation  Heart Failure

Vascular disease (condition that affects your circulatory system)  Unsure

Figure 4.4: 'Part 2: patient information' section of the consultation record

This data is recorded on a paper-based patient consultation record, a copy of which is provided in Appendix F. This is self-reported data which is either reported by the patient or captured by specially trained healthcare advisors. All patient records are additionally reviewed prior to device fitting by the pharmacists working in the pharmacies.

#### 4.2.4.2 ABPM Data Analysis from the Paper-based Consultation Record

The following graphs demonstrate some of the data that can be generated from the ABPM paper-based consultation record. The purpose of illustrating this data is to demonstrate the wealth of data that is locked into paper-based consultation records in community pharmacy and the potential value of digitising this data.

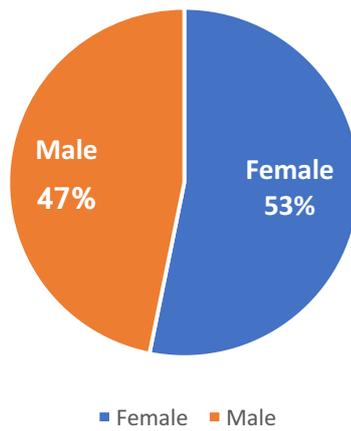


Figure 4.5: Gender % presenting for the ABPM service

Of the n=583 patients availing of the ABPM service across 21 pharmacy locations between 2014 and 2016, 53% (310/583) of all patients were female as shown in figure 4.5. Of the patients availing of the ABPM service, a slightly higher percentage of women reported having Type 2 diabetes compared to men (3.3% (female) versus 2.6% (male)) with Type 1 being reported slightly higher in the male population (1.5% versus 1.0%). Overall both genders presenting for the service reported not being diabetic (95.9% (male), 95.8% (female)) equally. This can be seen in figure 4.6 below.

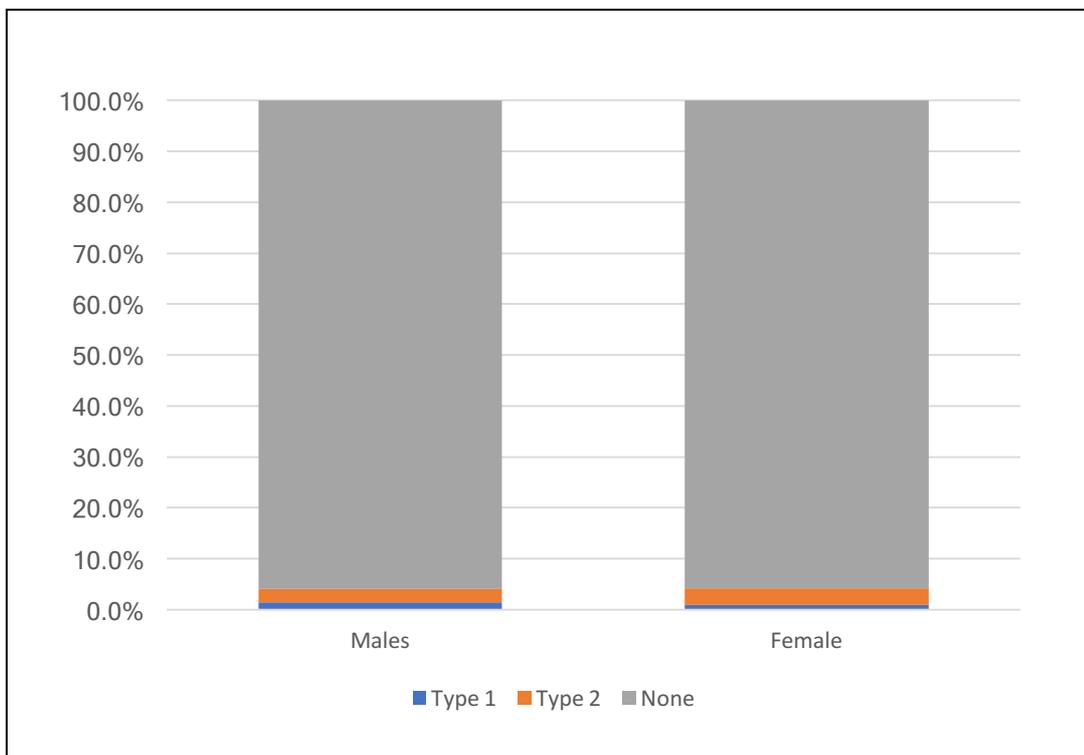


Figure 4.6: Gender – Diabetic % presenting for the ABPM service

2% of the data pertaining to question on the record ‘Do you have diabetes?’ was missing or incomplete (figure 4.7).

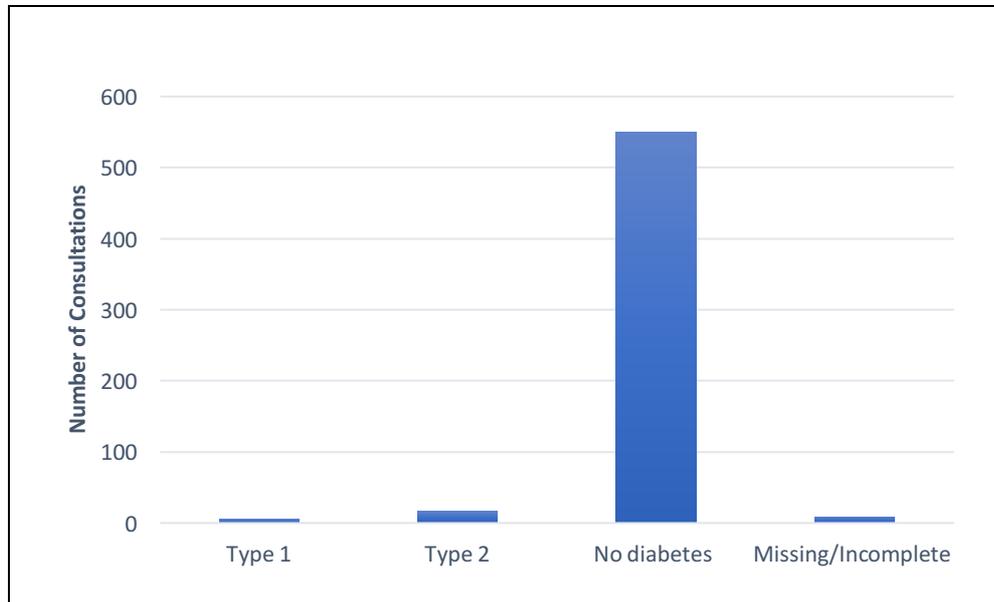


Figure 4.7: Diabetic Data of patients presenting for the ABPM service

Of the patients availing of the ABPM service, both males and females equally reported having high cholesterol (25.5% (males) versus 26.7% (females)) with both genders equally reporting that they were unsure if they had high cholesterol (24.3% (males) versus 21.5% (females)) as shown in figure 4.8 below.

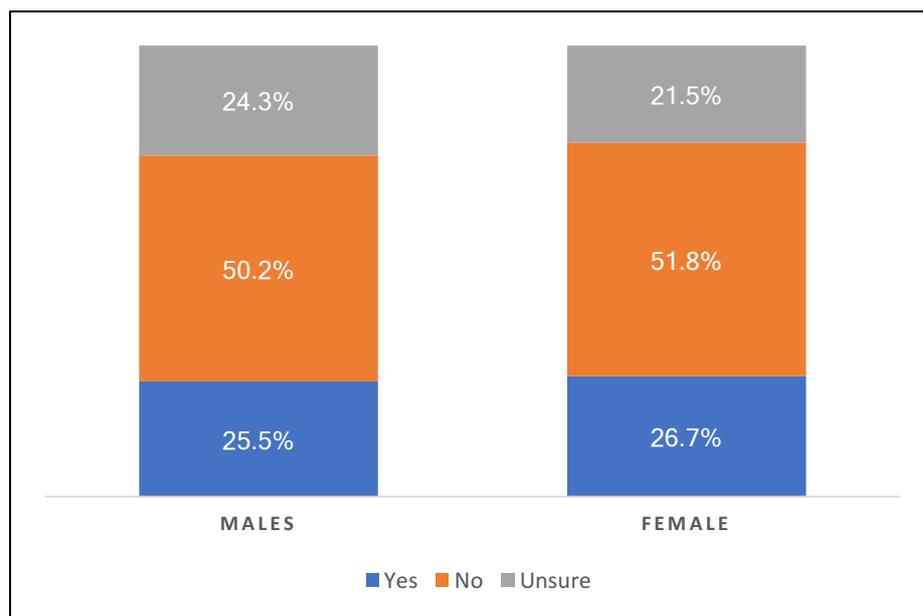


Figure 4.8: The number of patients presenting for the ABPM service who reported having high cholesterol

1.5% of the data pertaining to question on the record 'Do you have high cholesterol?' was either missing or incomplete (figure 4.9).

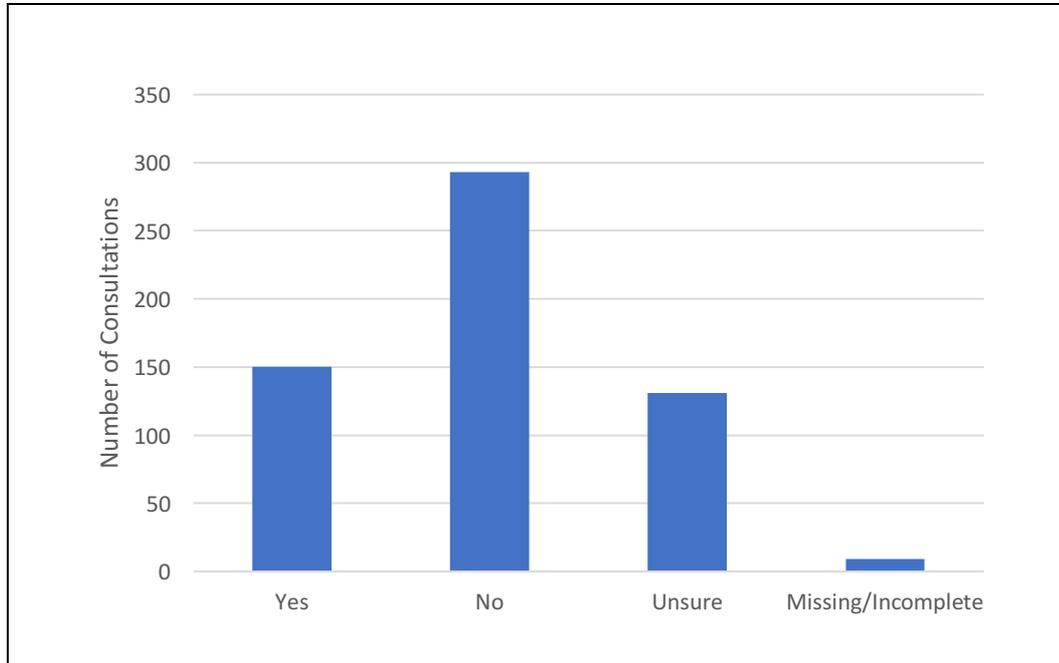


Figure 4.9: The number of patients presenting for the ABPM service who have high cholesterol

Patient reported data relating to the following cardiovascular risk factors are collected as part of the ABPM service: Ischaemic Stroke, TIA-Trans Ischaemic Attack (mini stroke), Haemorrhagic Stroke, Heart Attack, Atrial Fibrillation, Heart Failure and Vascular disease (figure 4.10).

**Part 2: Patient information continued**

Do you have high cholesterol? Yes  No  Unsure

Have you ever had any of the following: (Please tick one or more as relevant)

Ischaemic Stroke  TIA-Trans Ischaemic Attack (mini stroke)

Haemorrhagic Stroke  Heart Attack  Unsure

Have you ever been diagnosed with any of the following: (Please tick one or more as relevant)

Atrial Fibrillation  Heart Failure

Vascular disease (condition that affects your circulatory system)  Unsure

Figure 4.10: Patient reported cardiovascular risk factors

Figure 4.11 below shows that 93.4% (545/583) of data for the first set of cardiovascular risk factors was missing or no answer was recorded on the form. Figure 4.12 below shows that

88.5% (516/583) of data for the second set of cardiovascular risk factors was missing or, again, no answer was recorded on the form. It is important to note that there was no option to record 'None of these' so in this context 93.4% and 88.5% could be due either to missing/incomplete data or because of poor form design.

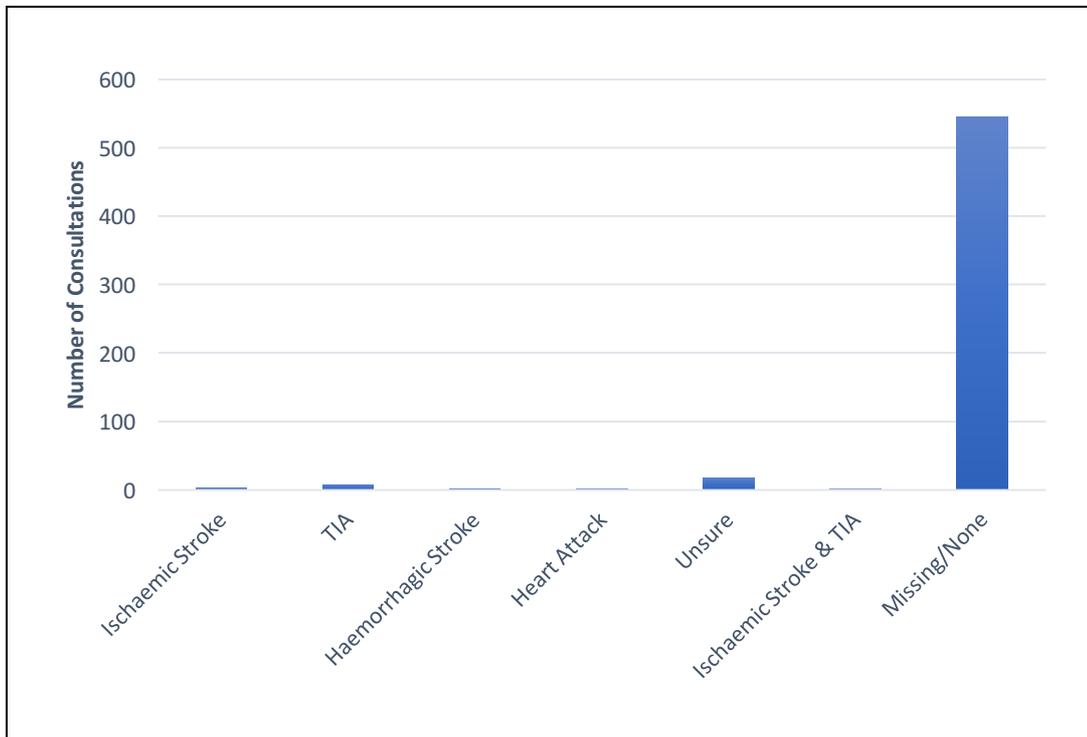


Figure 4.11: Cardiovascular data of patients presenting for the ABPM service

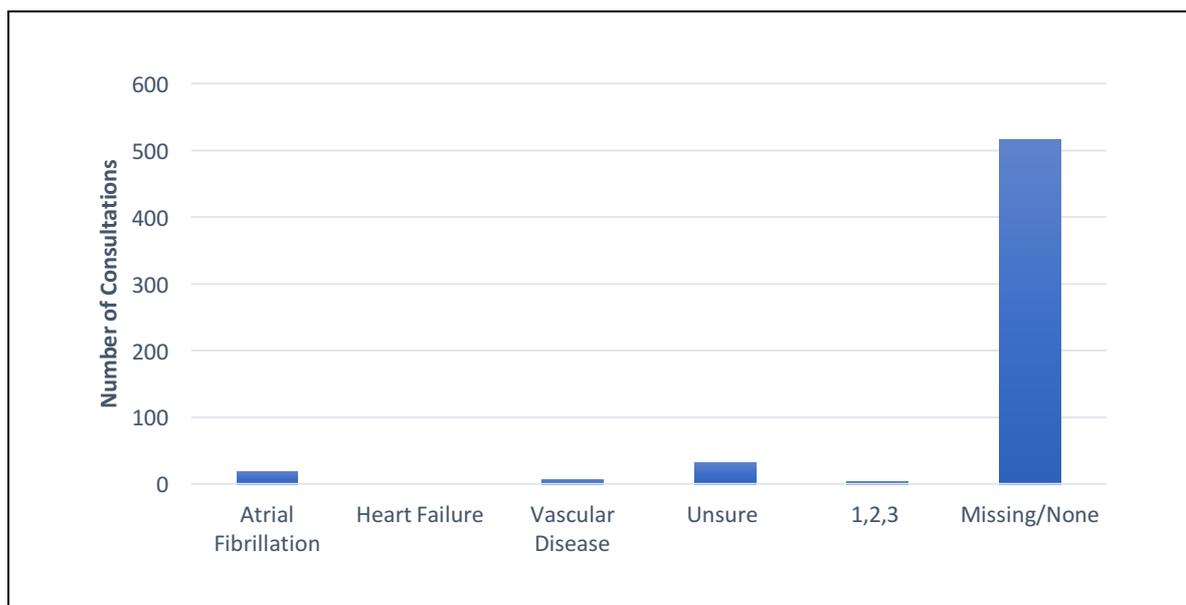


Figure 4.12: Cardiovascular data of patients presenting for the ABPM service

(Block 1,2,3 in the above chart refers to patients who ticked that they have atrial fibrillation, heart failure and vascular disease).

Data from the service can also demonstrate what days of the week the service is accessed most. From the data provided, it can be seen that the service is accessed frequently during the week. This possibly demonstrates that the reduced availability of GP services at weekends does not influence the timing of the use of the service. Figure 4.13 below shows that Tuesdays (17.7%) and Fridays (17.5%) are the most popular days for accessing the service.

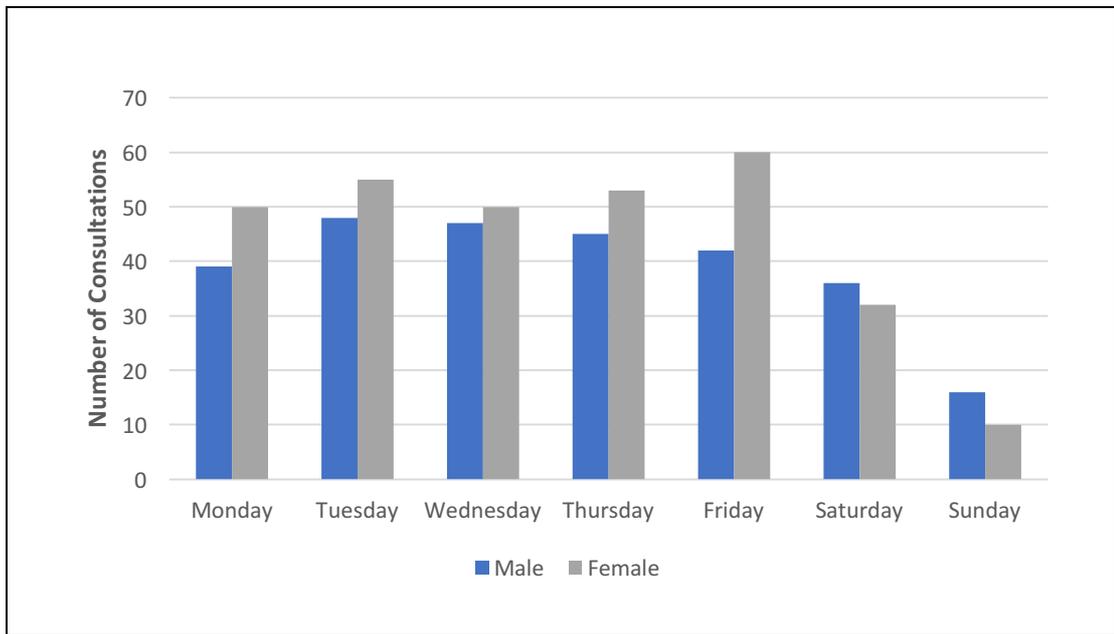


Figure 4.13: Consultations by Day of Week for the ABPM service

Information on medication history is collected in Part 2 of the ABPM consultation record as shown in figure 4.14 below.

Do you take any medication? Yes  No  If yes please detail:

Figure 4.14: Question on the ABPM record regarding patient medication

Figure 4.15 below shows that 5% of these records had missing or incomplete data. 65% of patients reported taking medication. But unfortunately, as this is paper-based consultation record, the medication details box is a free text box which makes it very difficult to audit or use this information for research purposes. The opinion of the researcher is that the instructions for

the free text box are inadequate and does not provide information on what details are required. 93% of the 65% of patients who reported taking medication had an entry in the “*Do you take any medication*” box. Only 24% of these medications were entered correctly i.e. had a drug name and strength (e.g. Lipitor 10mg).

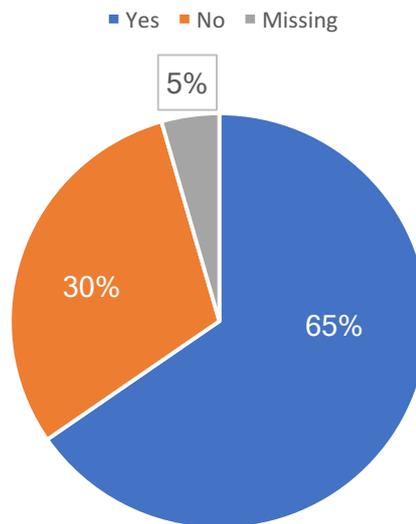


Figure 4.15: % of patients that reported taking medication who presented for the ABPM service

#### 4.2.4.3 Data Analysis from the ABPM Device

24-hours after the fitting consultation the patient returns to the pharmacy and the ABPM device is removed, the readings from the device are downloaded and an electronic results report is prepared based on readings over the previous 24-hours. The ambulatory blood pressure monitor that is used for the service is the Microlife Watch BP03 AFib device. Below is an example of the Microlife ABPM report that is generated as part of the ABPM service in the pharmacy (figure 4.16).

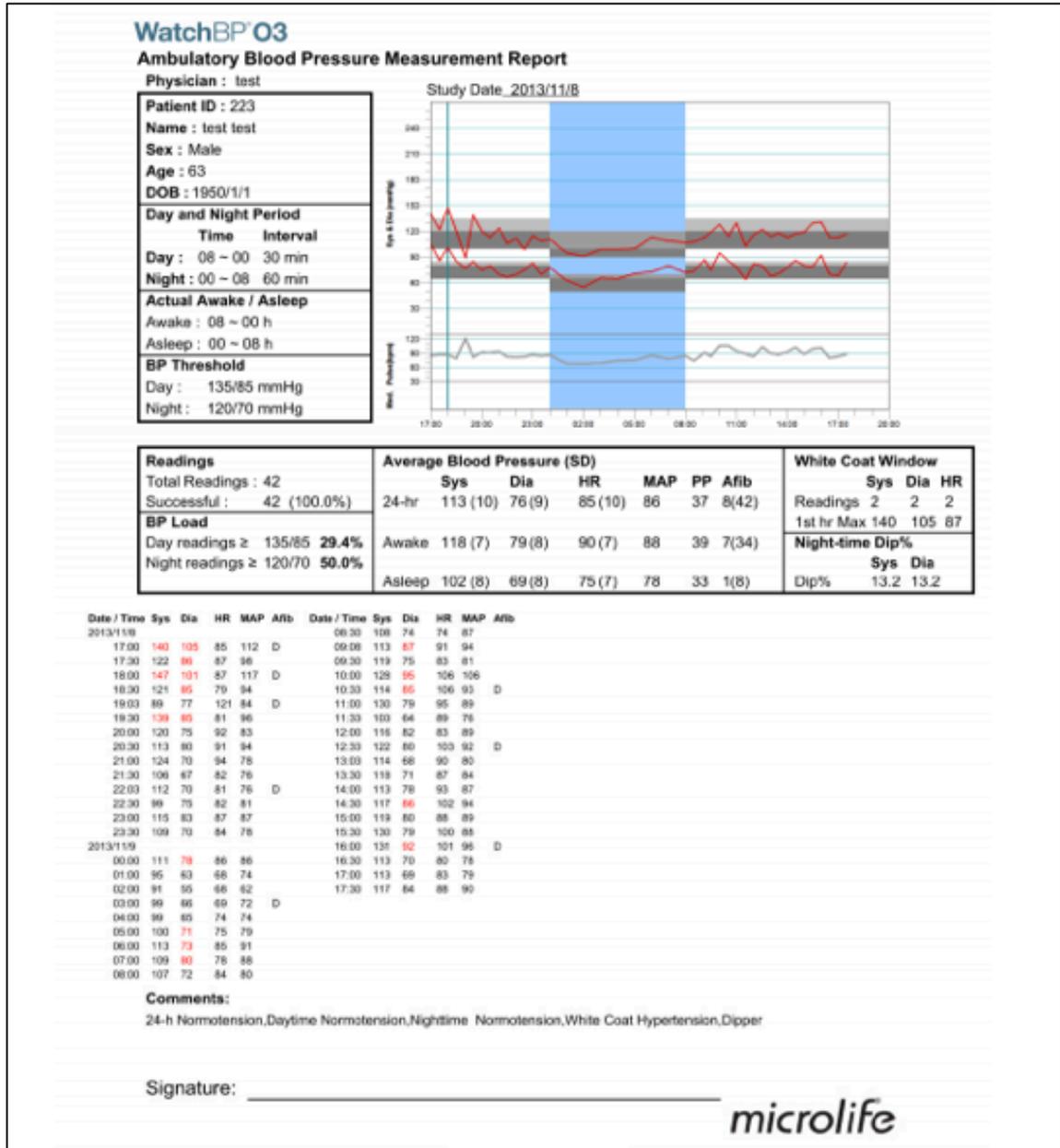


Figure 4.16: Sample of an ABPM generated results report

Results that can be analysed from ABPM device once downloaded include (figure 4.17): isolated 24-hour systolic hypertension, isolated 24-hour diastolic hypertension, daytime hypertension, isolated daytime systolic hypertension, isolated daytime diastolic hypertension, nocturnal hypertension, isolated night-time diastolic hypertension, isolated night-time systolic hypertension, white coat hypertension, night-time dip % and masked hypertension. Masked hypertension refers to the condition where blood pressure may be normal in the office environment and abnormally high out of the medical environment (Mancia et al., 2013). White coat hypertension and night-time dip % will be discussed in more detail subsequently.

Readings	Average Blood Pressure (SD)							White Coat Window			
	Sys	Dia	HR	MAP	PP	Afib	Sys	Dia	HR		
Total Readings : 42	24-hr	113 (10)	76 (9)	85 (10)	86	37	8(42)	Readings	2	2	2
Successful : 42 (100.0%)	Awake	118 (7)	79 (8)	90 (7)	88	39	7(34)	1st hr Max	140	105	87
BP Load	Asleep	102 (8)	69 (8)	75 (7)	78	33	1(8)	Night-time Dip%	Sys	Dia	
Day readings $\geq$ 135/85								Dip%	13.2	13.2	
Night readings $\geq$ 120/70											

Figure 4.17: Results that can be extracted from ABPM device once downloaded

Nocturnal hypertension can also be extracted from the results. This data is of significant value as nocturnal blood pressure is now recognised to be superior to daytime blood pressure in predicting cardiovascular risk (O'Brien et al., 2013). The results of the ABPM device can also yield data on the ‘dipping status’ of the patient. Blood pressure normally decreases during the night, this is defined as ‘dipping’ (Mancia et al., 2013). In the context of blood pressure measurements, it is of value to know if a patient is a dipper (desirable), a non-dipper (may have some health consequences) or an individual whose blood pressure falls more than would be expected (known as extreme dipping - this has adverse health effects also). A person may also be a reverse dipper, which is an increase in nocturnal blood pressure. An example of ‘dipping’ in an ABPM results graph can be seen below in figure 4.18 with the blue shaded area referring to night-time asleep measurements.

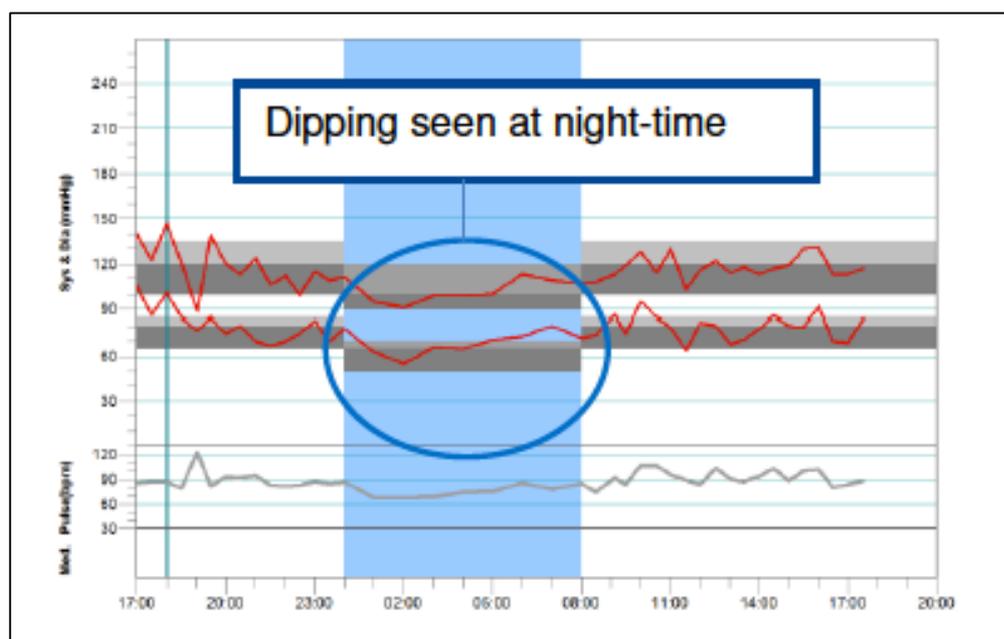


Figure 4.18: Example of ‘dipping’ in ABPM graph

Of the cohort of patients availing of the ABPM service, 34% of patients presented as ‘non-dippers’, 50% as ‘dippers’, 11% as ‘extreme dippers’ and 5% as ‘reverse dippers’ as shown in figure 4.19 below, highlighting the valuable data that is captured in community pharmacy.

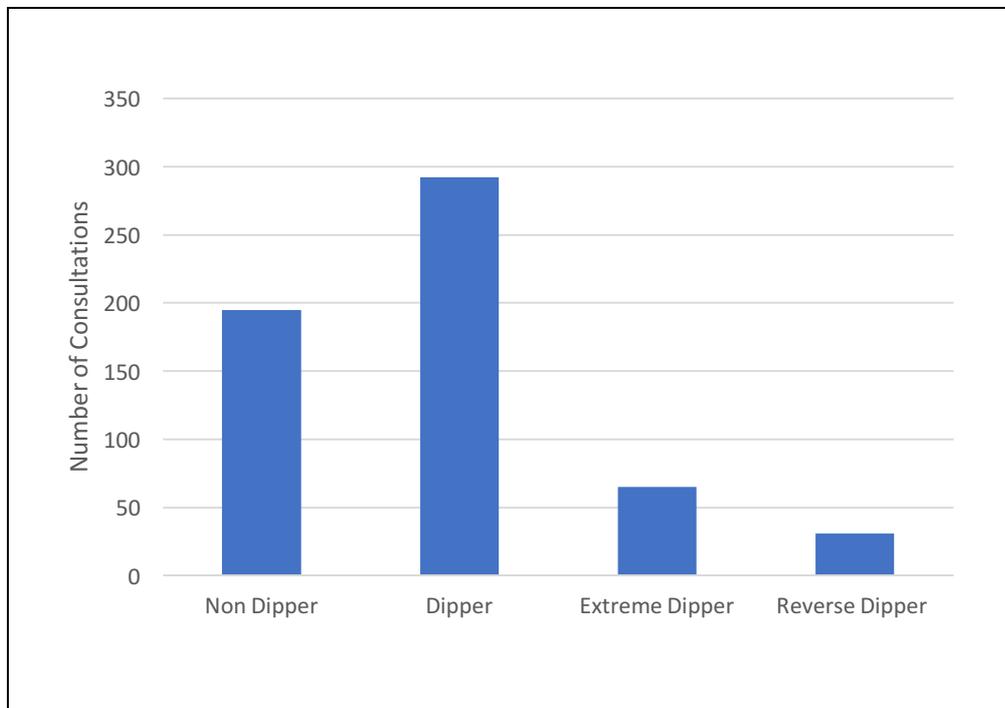


Figure 4.19: ‘Dipping status’ of patients assessing the service

Other results that can be extracted from the results for patients include: Heart Rate (HR), Mean Arterial Pressure (MAP), Pulse Pressure (PP), Atrial Fibrillation (AFib) and White coat hypertension.

White coat hypertension refers to the situation where a person’s blood pressure is higher when it is taken in a medical setting for example a pharmacy or a GP surgery compared to when it is taken at home (Blood Pressure Association, 2008). Studies have shown that the overall prevalence of white coat hypertension averages approximately 13% (Mancia et al., 2013). NICE (the National Institute for Health and Care Excellence) have identified that failure to identify white coat hypertension can lead to inappropriate treatment in patients who have normal blood pressure and equally in patients with high blood pressure who show a white coat effect may receive additional antihypertensive medications or inappropriate dose titrations. It is therefore essential to identify patients with white coat hypertension as this would potentially reduce the number of antihypertensive medications being prescribed which could lead to financial savings (NICE, 2016). A study completed by Lorgelly et al. identified the role of ABPM in the

identification of white coat hypertension (Lorgelly et al., 2003). For the cohort of patients in this research, 9.1% of patients exhibited white coat hypertension (figure 4.20) (this was the blood pressure that was taken when the ABPM monitor was fitted at the start of the consultation process as described in section 4.2.3).

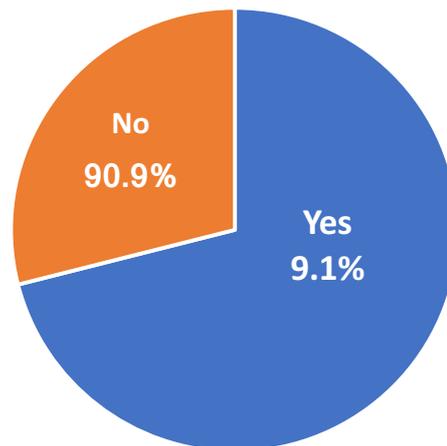


Figure 4.20: Number of patients presenting for the ABPM service who had white coat hypertension

All the data mentioned in this section (4.2.4.2) is electronically generated, none of which was missing – the data was 100% complete. Some of the results that are available are highlighted below. Figure 4.21 below shows that 48.8% of patients availing of the ABPM service had high blood pressure over a 24-hour period.

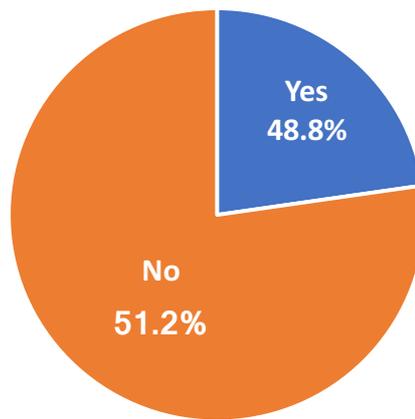


Figure 4.21: % of patients with 24-hour hypertension assessing the ABPM service

Findings from other research analysing the service found hypertension of all types was more prevalent in males than in females (24-hour hypertension  $\chi^2 = 17.03$ ,  $p < 0.001$ , daytime hypertension  $\chi^2 = 25.38$ ,  $p < 0.001$  and night-time hypertension  $\chi^2 = 12.21$ ,  $p < 0.001$ ) (O'Dwyer, 2017). Prevalence of any hypertension in the sample of patients attending community pharmacy for ABPM was 64.3% (95% CI: 60.4-68.2). Prevalence was higher in males ( $\chi^2 = 19.50$ ,  $p < 0.001$ ). Masked hypertension was observed in 6.9% of patients (95% CI: 4.8-9.0) and masked uncontrolled hypertension in 3.6% of patients (95% CI: 2.1-5.1). Neither were statistically more prevalent in one gender versus the other. No significant differences in prevalence by age range were observed for any measures (O'Dwyer, 2017).

The ambulatory blood pressure monitor that is used for the service is the Microlife Watch BP03 AFib device. This device has the added unique feature of being able to opportunistically detect the presence of atrial fibrillation in patients undergoing a 24-hour blood pressure monitoring assessment. Figure 4.22 below shows that the prevalence of pulse patterns which is potentially indicative of atrial fibrillation was detected in 11% of patients assessing the service, whereas only 4.5% of these patients self-reported having atrial fibrillation on the paper-based consultation record.

■ Yes ■ No ■ Yes but under 50

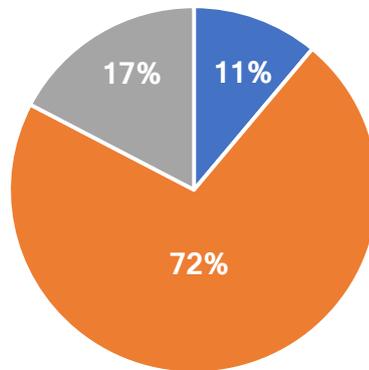


Figure 4.22: Prevalence of pulse patterns potentially indicative of atrial fibrillation in the study sample

Healthcare providers would generally not screen for atrial fibrillation in those patients less than 50 years of age due to the low prevalence of atrial fibrillation and low incidence of stroke in younger patients (Camm et al., 2012), which is the explanation for ‘Yes but under 50’ in the figure 4.22 above.

Numerous studies have shown that improved blood pressure management can be achieved with pharmacist interventions whether it is alone or in collaboration with other healthcare professionals (Santschi et al., 2014, Clark et al., 2015, Morgado et al., 2011, Cheema et al., 2014, Chiazor et al., 2015). An Irish study comparing ABPMs results that were recorded in pharmacies and in primary care practices has shown that the blood pressure characteristics of patients presenting to both healthcare providers are similar (James et al., 2014).

#### 4.2.5 Completeness

From the data analysed in this research, there were significant amounts of incomplete/missing records from the paper-based consultation record (1.7% of data was missing from the cholesterol question, 1.7% was missing for the diabetic data information, 93.4% and 88.5% was missing for cardiovascular data I and II respectively (as mentioned previously could be due to poor form design also) and 4.5% of the medication data field was left incomplete). In

comparison, there was 100% complete data from the results that were electronically generated, highlighting the value and benefit of digitising clinical service records in community pharmacy.

As described above, analysis of the ABPM paper-based records for this research did reveal significant amounts of missing/incomplete records. Explanations for missing or incomplete data could be numerous such as: the patient did not want to answer the question, the pharmacist or advisor did not write the answer down (the question could have been answered verbally), the pharmacist or advisor did not ask the question, maybe the answer was not available in the options given and the 'none of the above' option was not available. Unfortunately, a researcher may not know why the data is incomplete or missing but incomplete or missing data could potentially influence the integrity of the research. A benefit to digitising records is the ability to have structured records. Such records have been shown to contribute to more complete and reliable records (Vuokko et al., 2017).

#### 4.2.6 ABPM Discussion

It is clear from the data that has been presented in this research that the ABPM service has an abundance of data that is extremely valuable. The ABPM service generates valuable demographic, observational and clinical data. This service presents the prevalence of blood pressure profiles such as normotension, masked hypertension and white coat hypertension. This is data which can be used to describe the cardiovascular disease risk factor profiles of patients availing of the service which is extremely valuable and significant data.

## 4.3 Pharmacy Streptococcus A (Strep A) Testing

### 4.3.1 Introduction

Sore throats are common with most people suffering at least two to three sore throat episodes every year (HSE, 2017b). Approximately 40% of people experiencing a severe sore throat visit their GP (Hannaford et al., 2005). The majority of sore throats occur due to a viral infection, with 85% of cases resolving within 7 days without the need for medical treatment (HSE, 2017b). Antibiotic treatment is only recommended for one particular strain of bacteria, Strep A (Aalbers et al., 2011). However, over prescription of antibiotics for sore throats is common, promoting antibiotic resistance (Palla et al., 2012, WHO, 2016). Patients commonly visit their GP with symptoms of a sore throat. In the majority of cases the cause is viral and only symptomatic treatment, such as over the counter (OTC) pain relief, lozenges, sprays, is needed (Thornley et al., 2016).

However, patients frequently request antibiotics for sore throats. Reports have estimated that over prescribing of antibiotics for sore throats is prevalent across numerous populations; antibiotic prescribing rates for sore throats in Australia, the United States (US) and Holland are estimated to be 89%, 73% and 52% respectively (Worrall et al., 2007). However, it is estimated that only 10% of adult patients presenting with a sore throat require an antibiotic (Centre for Clinical Practice at NICE, 2008, Worrall et al., 2007, Klepser et al., 2016). A study in the US estimated that 34 million antibiotics were prescribed unnecessarily between 2010 and 2011 (Fleming-Dutra et al., 2016). Antibiotics are only of benefit in the treatment of bacterial infections e.g. Strep A (not viruses). Hence, by helping patients to determine if their sore throat is related to a bacterial or a viral infection, healthcare providers such as pharmacists can help people make better choices about the most appropriate treatment for their symptoms.

A community pharmacy Streptococcus A (Strep A) testing service as provided in a chain of 83 community pharmacies. This service helps to identify the presence of a sore throat caused by a bacterial infection.

#### 4.3.2 What is the pharmacy Strep A Testing Service?

The pharmacy Strep A testing service is a service that helps identify the presence of a sore throat caused by a particular type of bacterial infection, commonly referred to as Strep A, through use of clinical assessment skills in combination with a throat swab test. The service uses the Centor Criteria (Centor et al., 1981) with rapid antigen detection testing (where appropriate).

The Centor Criteria is a clinical prediction rule which was developed to guide diagnosis of Strep A pharyngitis (sore throat). The four Centor Criteria are:

1. History of fever (Yes = 1 point)
2. Absence of cough (Yes = 1 point)
3. Presence of tender anterior cervical lymphadenopathy (swollen lymph nodes) (Yes = 1 point)
4. Presence of tonsillar exudates (Yes = 1 point)

A Centor score of 0 or 1 point suggests that the risk of a Strep A infection is less than 10% (Centor et al., 1981). A Centor score of 3 suggests a 32% chance of a Strep A infection and a score of 4 suggests a 56% chance of such an infection (Pelucchi et al., 2012).

Rapid antigen detection testing is a point of care testing diagnosis method used to detect Strep A. The throat swab test that is used in the service is the OSOM Strep A test. This method allows detection of the bacterium to be carried out in the pharmacy. Results from the test are available within 5 minutes. The OSOM Strep A test is a rapid antigen detection test with 96% sensitivity and 97.8% specificity. It is capable of qualitatively detecting the presence of Strep A from a swab taken from back of the throat (completed by a trained pharmacist) (Sekisui Diagnostics LLC, 2012).

The service is offered to customers, aged 16 years and over, who present with certain sore throat symptoms. It begins with the patient undertaking a consultation by a trained healthcare advisor, to check if the person with the sore throat is eligible for the service, followed then by a trained pharmacist who will complete a physical examination of the throat and complete a throat swab, if required (Thornley et al., 2016).

### 4.3.3 Patient Journey for the Pharmacy Strep A Service

Patients aged 16 years or over presenting with a sore throat lasting 3-9 days are offered the service (figure 4.23). Ineligibility criteria include those with prior antibiotic use or presenting with ‘red flag’ symptoms which require further referral. A healthcare advisor then completes the patient information section, as per figure 4.24, and obtains informed consent from the patient.

**1.1 Eligibility Criteria**  
If the patient answers **YES** to any of the following, then they are not suitable for the service – refer to Pharmacist.

Has the patient had symptoms for 10 days or more? Yes  No

Has the patient had symptoms for less than 3 days? Yes  No

Is the patient under 16 years old? Yes  No  note age

Has the patient already taken antibiotics for their sore throat? Yes  No

Are the patient's symptoms improving? Yes  No

Note any symptoms or additional information in the space below:

---

---

Figure 4.23: ‘Eligibility Criteria’ section of the record

**Patient Information**

First Name: \_\_\_\_\_

Surname: \_\_\_\_\_

Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date of birth DD/MM/YYYY: \_\_\_\_\_

Contact number (preferably mobile): \_\_\_\_\_

Email: \_\_\_\_\_

Are you currently taking any medication or diagnosed with a medical condition? Yes  No

If yes, please detail  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Patient Consent**

I confirm that I have read and understood the contents of the Boots Sore Throat Test and Treat leaflet and that the information I provide is correct to the best of my knowledge. I am happy to proceed with the Sore Throat Test and Treat Service and understand this involves allowing the Pharmacist to undertake a physical examination of my throat as well as a throat swab where necessary. I understand that the throat swab will only be offered if the Pharmacist believes it's appropriate for me and that I may be referred to my Doctor for follow-up care. I'm aware that Boots will retain this consultation record form in a manner consistent with Data Protection Requirements for a period of 2 years.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Figure 4.24: 'Patient information' section of consultation record

As described in section 4.3.2, patients presenting with a sore throat are clinically screened for the presence of four Centor Criteria. Using this assessment, patients are graded using a point system which will support the pharmacist's decision in recommending treatment options for the patient. One point is added for each positive criterion and the higher the Centor Score the higher the likelihood of Strep A.

Once the eligibility has been confirmed, the trained healthcare advisor then completes section 1.2 of the consultation record as shown below in figure 4.25.

**1.2 Centor – Part 1**

- What is the patient's temperature: \_\_\_\_\_ °C

If the patient's temperature is <38°C, have they recorded a temperature ≥ 38°C during this illness? Yes  No

If YES, please note the:

- Patient recorded temperature: \_\_\_\_\_ °C
- Date patient recorded this temperature:
- Does the patient have a current or history of a fever of 38°C or more?  
Yes  No  Score  (score 1 if Yes)
- Is a cough absent?  
Yes  No  Score  (score 1 if Yes)

Figure 4.25: 'Centor – Part 1' section of the record

If the total score is 1 or 2, it is unlikely that the patient has a bacterial infection and proceeding to conduct a throat swab test is therefore not necessary. The consultation outcome section of the consultation record should then be completed (figure 4.26).

**3. Consultation Outcome**

Self-management advice given: Yes  No

OTC products recommended? Yes  No

Referred to Doctor? Yes  No

Reason: \_\_\_\_\_

Figure 4.26: 'Consultation Outcome' section of the record

If the Centor Score is 3 or 4 then it is possible that the patient may have a Strep A infection and conducting a throat swab test to check for the presence of Strep A is indicated.

**2.2 Centor – Part 2**

**Complete physical examination**

Are the patient's lymph nodes tender? Yes  No  Score  (score 1 if Yes)

Does the patient have any exudates on the tonsils?  
(if unilateral symptoms, refer to Doctor as required)

Yes  No  Score  (score 1 if Yes)

**Total Centor score: /4 (results of Part 1 & Part 2)**

If total score is 3 or 4 perform Throat Swab Test  
If total score is 1 or 2 complete Consultation Outcome section below

Figure 4.27: 'Centor – Part 2' section of the record

At this point a sore throat specimen is collected by the pharmacist with the patient's permission and this is then tested for the presence of Strep A. Results of this test, which are available within 5 minutes, will then be used to guide further treatment advice for the patient.

The swab from the throat is immediately put in the test tube containing the prepared solution and at the 5 minute mark the test strip is removed and the results are read. If Strep A has been detected a blue line will appear accompanied by a red control line as shown below in figure 4.28.

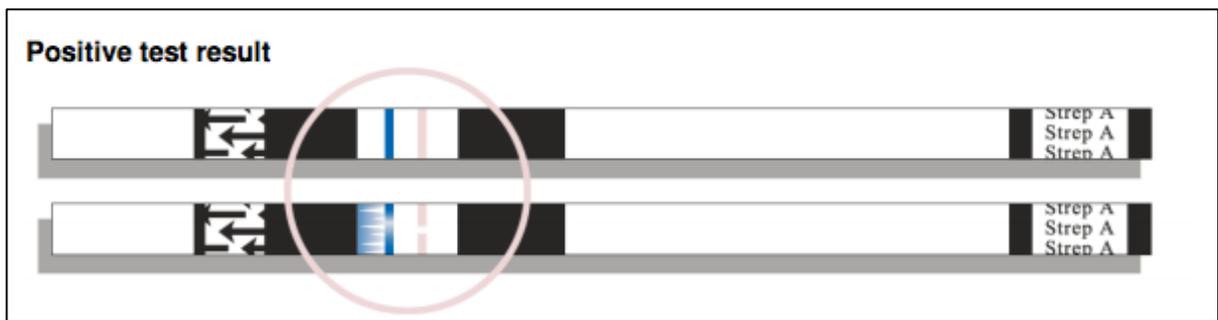


Figure 4.28: Sample Positive test result

If the result is negative, the blue line will not appear and it is unlikely that the patient has a Strep A throat infection. If the result is positive, presence of Strep A has been detected and the patient likely is experiencing a Strep A bacterial throat infection and can be referred to the GP with an accompanying letter.

#### 4.3.4 Pharmacy Strep A Data

Patients who avail of the pharmacy Strep A service undergo a service consultation where data relating to their demographic characteristics, reasons for availing of the service and eligibility criteria are collected. Data that can be extracted for secondary use, both self-reported and diagnostic, from the service consultation record (see Appendix G) includes:

- a) patient demographics (name, age, geographical location, gender);
- b) reason for requesting the service (self-referral, referred by doctor, referred by family/friend, pharmacy team recommendation);

- c) eligibility criteria (Has the patient had symptoms for 10 days or more? Has the patient had symptoms for less than 3 days? Is the patient under 16 years old? Has the patient already taken antibiotics for their sore throat? Are the patient's symptoms improving?) (figure 4.24)
- d) Centor – part 1: (What is the patient's temperature? Is a cough absent? Has the patient as any visible signs or symptoms of any other infection or serious illness? Is the patient exhibiting any red flag symptoms requiring referral?) (figure 4.30)

Red flag symptoms that may indicate referral to a GP include: presence of skin rash, dysphagia (difficulty swallowing), drooling, noisy breathing, difficulty breathing, stridor (a loud, harsh, high-pitched respiratory sound), muffled voice, severe pain and/or other severe symptoms, symptoms that worsen very quickly (Thornley et al., 2016). These red flag symptoms can be seen in figure 4.29 below.

**2.1 Exclusion Criteria**  
 Check if patient is excluded from the service – refer to Doctor as required

**Check if the patient:**

Has any visible signs or symptoms of any other infection or serious illness? Yes  No

Is not exhibiting any red flag symptoms requiring referral Yes  No

**Red flag symptoms that may indicate referral include:**  
 Presence of skin rash, dysphagia (difficulty swallowing), drooling, noisy breathing, difficulty breathing, stridor (a loud, harsh, high-pitched respiratory sound) muffled voice, severe pain and/or other severe symptoms, symptoms that worsen very quickly

**If patient not excluded complete Centor Part 2 below**  
**If excluded go to Consultation Outcome Section below**

Figure 4.29: '2.1 Exclusion Criteria' section of the record

- e) Centor – Part 2: (Are the patient's lymph nodes tender? Does the patient have any exudates on the tonsils? Throat swab test consultation outcome: (positive or negative)).

**2.2 Centor – Part 2**

**Complete physical examination**

Are the patient's lymph nodes tender?    Yes  No     Score  (score 1 if Yes)

Does the patient have any exudates on the tonsils?  
(if unilateral symptoms, refer to Doctor as required)

Yes  No     Score  (score 1 if Yes)

**Total Centor score: /4 (results of Part 1 & Part 2)**

**If total score is 3 or 4 perform Throat Swab Test**  
**If total score is 1 or 2 complete Consultation Outcome section below**

**2.3 Throat Swab Test**

Lot number of swab test:

Expiry date:

Date and time swab test completed:

Test result outcome: +ve  -ve

**Provide post consultation leaflet, consultation summary and Doctor letter form and self-care advice as relevant**

Figure 4.30: '2.2 Centor - Part 2' section of the record

All the above data is recorded on a paper-based patient consultation record, a copy of which is provided in Appendix G. The data is captured by specially trained healthcare advisors, all patient records are additionally reviewed by the pharmacists working in the pharmacies during the consultation process.

#### 4.3.5 Pharmacy Strep A Data Analysis

As part of a separate research project, a selection of consultation forms was selected from consultations performed between 2015 and 2016 and this data was made available for the researcher in this study. Data was collated on a total of n=237 patients across multiple pharmacy locations. These patient records were then anonymised prior to sharing with the researcher. Anonymisation involved the removal of the 'Patient information' section of consultation record as shown in figure 4.25 and this anonymisation was completed by a different researcher who is using the data for separate research project. It is used in this study for secondary analysis with a view to assessing the quantity and quality of data recorded. Removal of the 'Patient information' section meant that no information regarding the name, address, date of birth or patient's email details was available to the researcher for this study. The researcher was also provided with a pre-coded Excel spreadsheet for the data which facilitated the researcher to complete accurate data analysis. Descriptive statistics were used by the researcher to report demographic data, with the results presented as absolute numbers and percentages.

Data was collated on a total of n=237 patients across multiple pharmacy locations between 2015 and 2016. The most prominent age group accessing the service was patients 26-34 years old (18%) as shown in figure 4.32. 60% of this cohort were female, however, 60% (143/237) of all patients presenting for the service were male as shown in figure 4.31. The records show that 13% of the gender data was missing or incomplete (figure 4.31) and 37% of data pertaining to age of the patient was either missing or incomplete (figure 4.32).

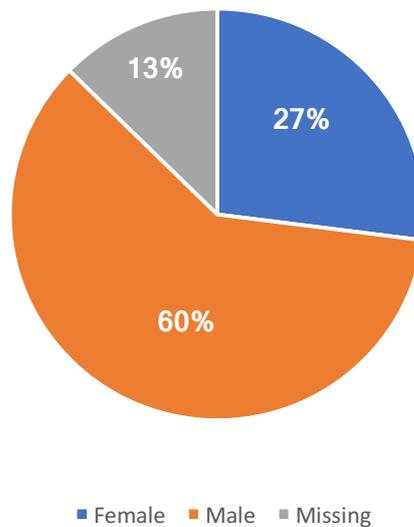


Figure 4.31: Gender % presenting for the pharmacy Strep A service

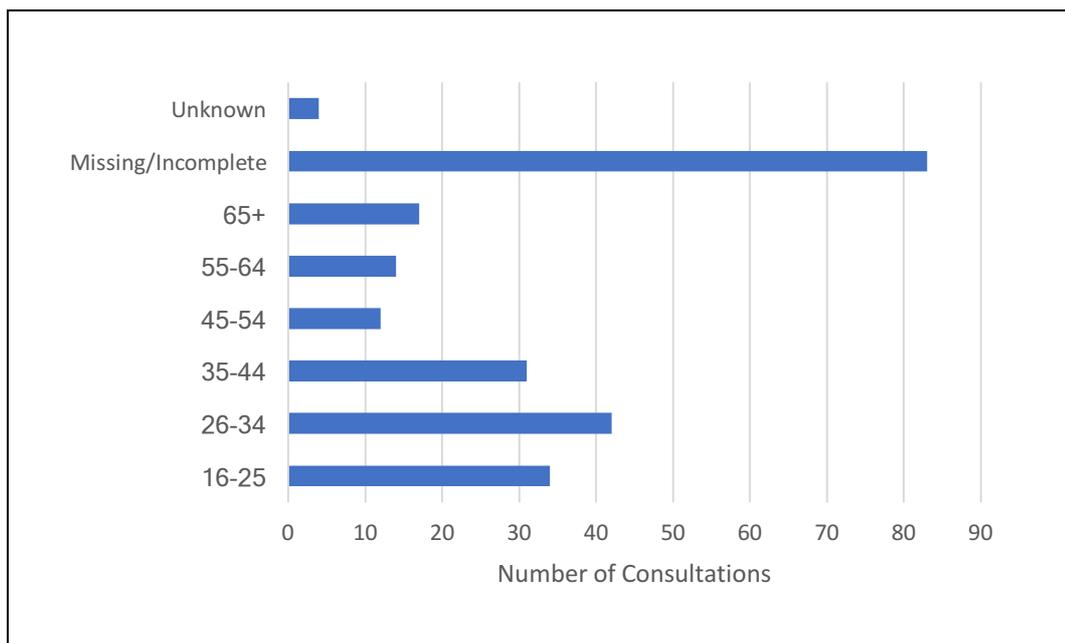


Figure 4.32: Age-Range of patients presenting for the pharmacy Strep A service

Data was available for 217 out of 237 patients (91.6%) on method of referral into the service. Over half of patients (51.5%, 122/237) self-referred into the service, 33% (78/237) of patients were recommended to the service by a member of the pharmacy they were visiting, 8% (8/237) of patients were recommended by friends or family and 1% (3/237) of patients were signposted to the service by a GP (patients could choose multiple responses). 8% (20/237) of this data was missing. These results are shown in figure 4.33 below.

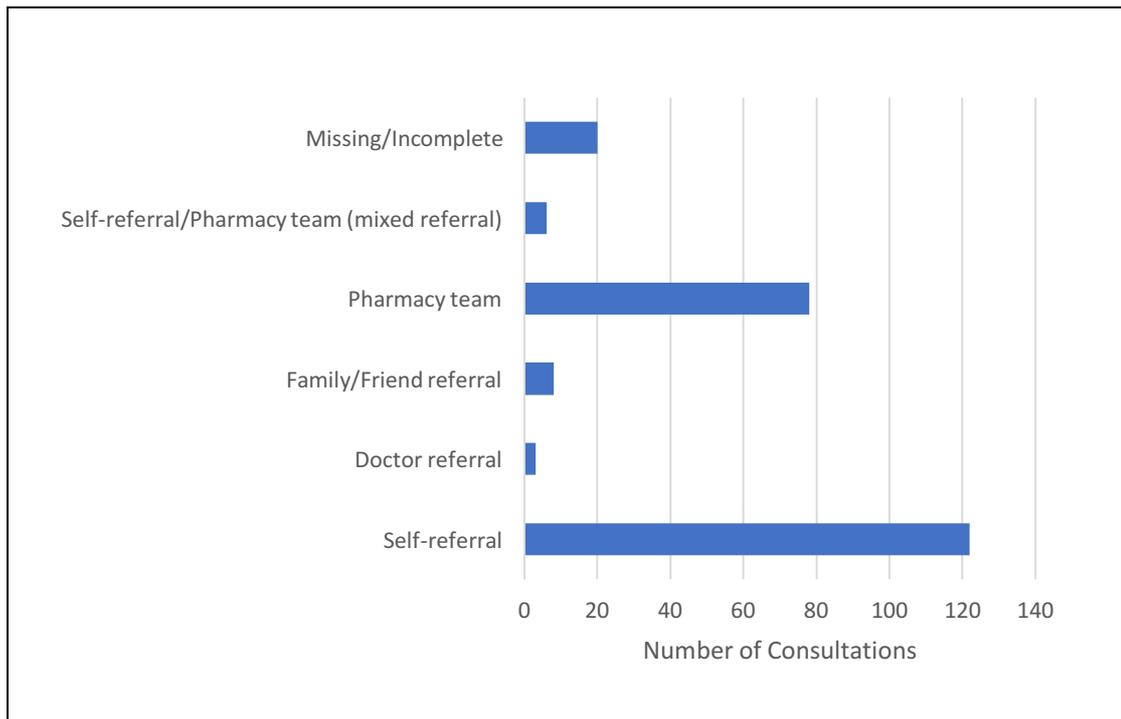


Figure 4.33: Reasons for choosing the pharmacy Strep A service

Of patients wanting to avail of the service, 8% (19/237) presented with symptoms for more than 10 days and 16% (38/237) had symptoms for less than 3 days meaning these patients were ineligible for the service. 5% (11/237) of the data relating to symptoms > 10 days and < 3 days was either missing or incomplete (figure 4.34).

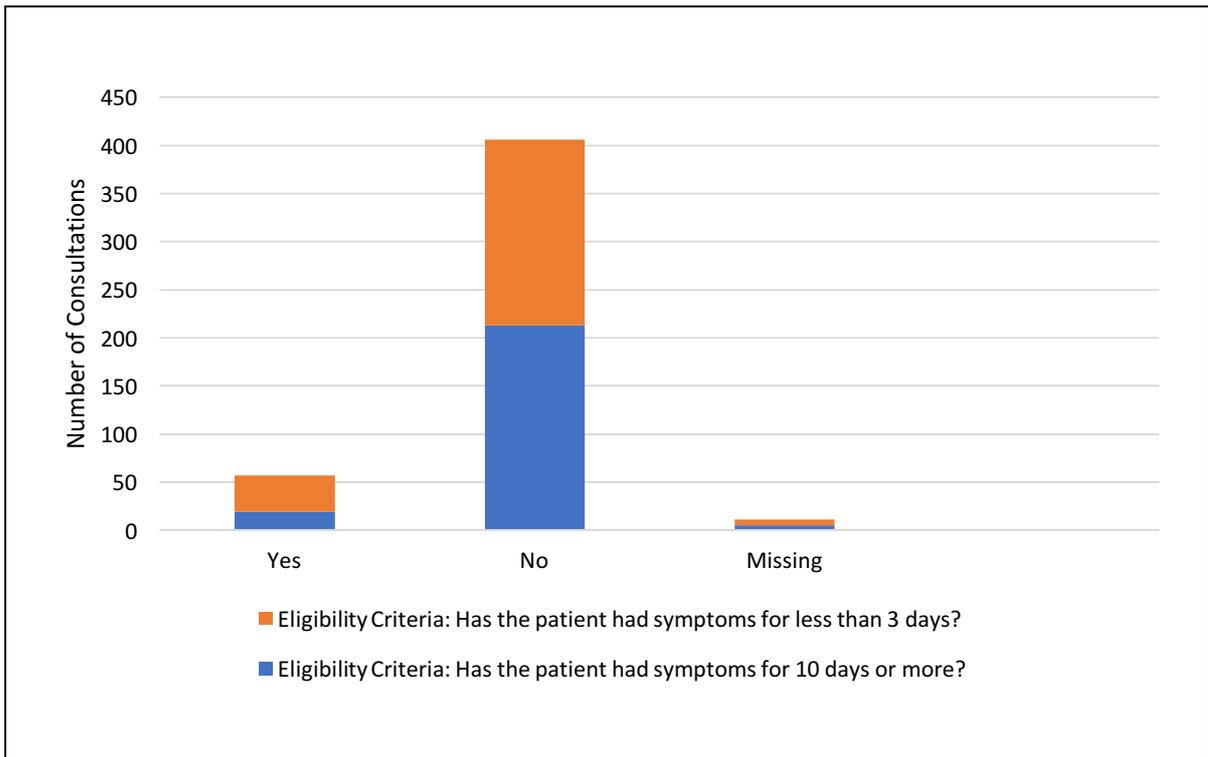


Figure 4.34: Eligibility Criteria regarding symptoms for presenting patients

75% (178/237) of patients who presented had no fever and 50% (118/237) of patients presented no symptoms of a cough. 5% (11/237) of the fever data was missing/incomplete and 4% (10/237) of the cough data was missing/incomplete from the records as shown below in figure 4.35.

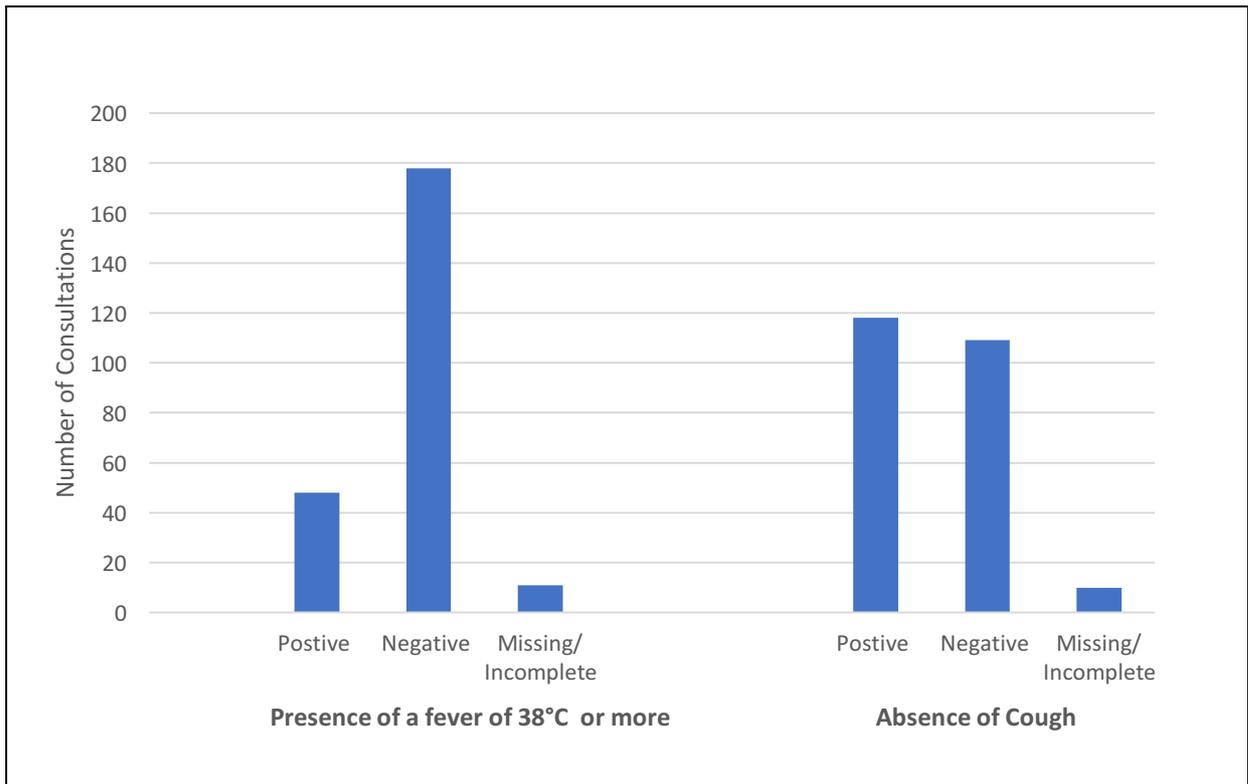


Figure 4.35: Centor Score (Part 1)

A breakdown of how many patients accessed each stage of the service is shown below in figure 4.36. 37% (88/237) reached stage 1 of the service, 49% (117/237) reached stage 2 of the service and 13% (31/237) were excluded from the service. 1% (1/237) of this data was missing or incomplete. Reasons for exclusion from the service included:

- Patients who presented with symptoms for either less than 3 days or more than 10 days (84%).
- Patients who had already taken an antibiotic for their sore throat (10%).
- Patients who presented but their symptoms were already improving (6%).

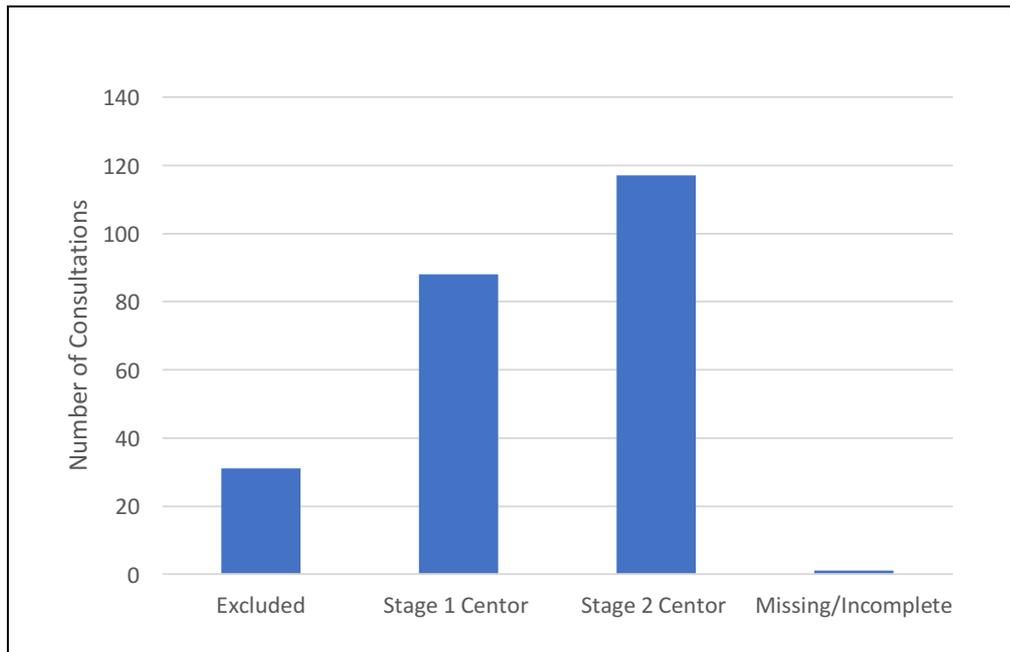


Figure 4.36: Centor Score (Part 1)

Of the 37% of patients swabbed, 20.5% (8/39) of these patients had a positive throat swab for Strep A and were referred to the GP. When compared to the total number of patients who presented for the service, the number of patients who had a positive throat swab for Strep A is 3.4% (8/237), which is slightly below the approximate number of 5% to 17% of sore throats that are caused by a bacterial infection (Aalbers et al., 2011). 3% of patients who attained a Centor score of 3 or 4 were not swabbed. The reasons for not swabbing included: asymmetric tonsillar swelling, refusal by patient, excessive exudate on the tonsils. 9% (22/237) of patients attending were referred to their GP, 45% (113/237) of patients were recommended OTC products and 50% (118/237) patients were given self-management advice as shown below in figure 4.38. The relevant section of the consultation record is shown below in figure 4.37.

3. Consultation Outcome	
Self-management advice given:	Yes <input type="checkbox"/> No <input type="checkbox"/>
OTC products recommended?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Referred to Doctor?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Reason:	<hr/>

Figure 4.37: 'Consultation Outcome' section of record

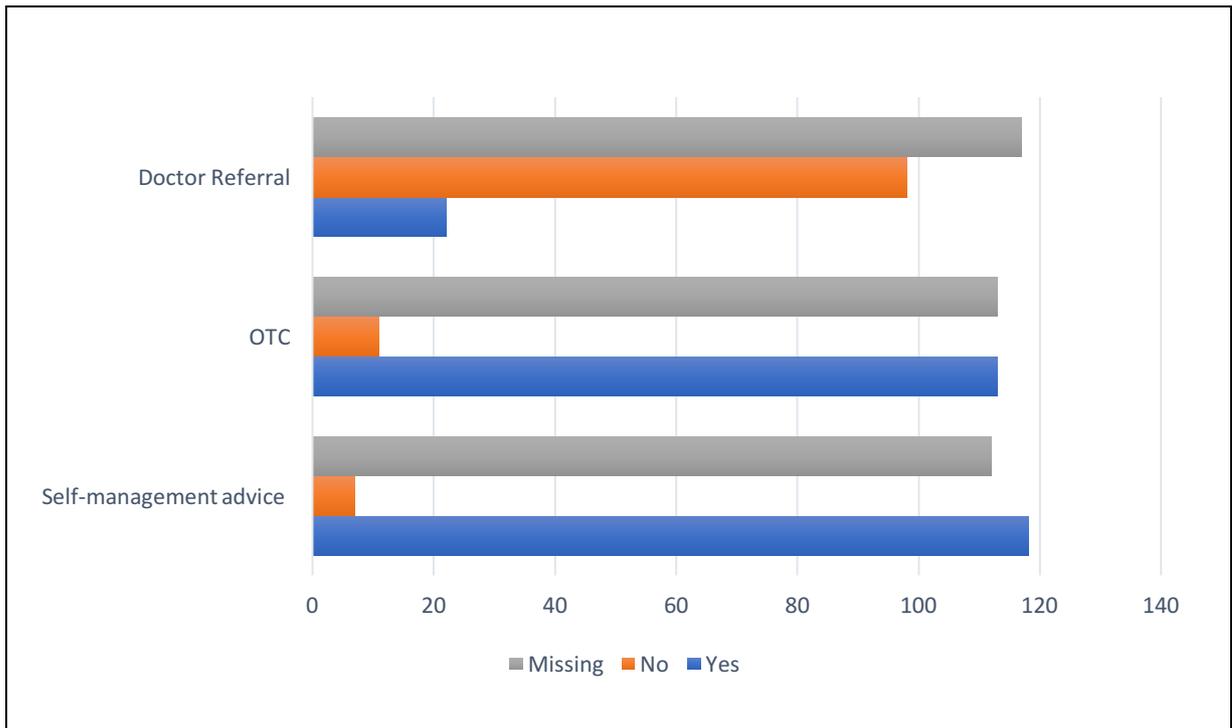


Figure 4.38: Consultation Outcome Result

#### 4.3.6 Completeness

Analysis of the pharmacy Strep A consultation records for this research revealed significant amounts of missing/incomplete records as was similarly found in the ABPM analysis. Table 5.1 below illustrates the amount of data that was either missing or incomplete for this clinical service. With reference to the level of missing/incomplete data for ‘Consultation outcome’ in table 4.1 below, it is important to note that pharmacists are accustomed to giving advice without documenting it. As a population, they are familiar with forms and completing consultation record forms for services but less so with recording their interventions.

Table 4.1: Percentages of missing or incomplete data for different sections of the consultation record form

Missing/Incomplete Data	%
Gender	13%
Age	37%
Reason for choosing the service	8%
Eligibility Criteria: Symptoms	5%
Presence of Fever data	5%
Absence of cough data	4%
Stage of Consultation reached	1%
Consultation outcome: Referred to Doctor?	50%
Consultation outcome: OTC products recommended?	48%
Consultation outcome: Self-management advice given	47%

As previously discussed for ABPM, data may be missing or incomplete for numerous reasons but digitising these records could potentially contribute to more complete and reliable records (Vuokko et al., 2017). With the imminent introduction of Healthmail (a secure clinical email system), results from both the ABPM service and the pharmacy Strep A service could be shared electronically with the appropriate healthcare provider. The capability to have these records in electronic format will support the functionality of sharing patient identifiable clinical information in a secure manner.

#### 4.3.7 Pharmacy Strep A Testing Discussion

It is clear once again from the data that has been presented in this research that the pharmacy Strep A service has an abundance of data that is extremely useful and valuable. The pharmacy Strep A service was piloted in a community pharmacy chain in the UK and as a result was named as one of eight schemes for the NHS Innovation Accelerator programme, which is designed to accelerate the roll-out of new treatments and technologies across the UK (The Pharmacist, 2017). This recognition again highlights the value of the pharmacy Strep A service and the wealth of data that is available from this service.

#### 4.4 Conclusion

This chapter has illustrated the wealth of data that is currently ‘locked’ into paper-based consultation records within the community pharmacy. It served to describe the type of data that is currently captured and discussed the potential value of this data being digitised. The two clinical pharmacy services that were analysed were an Ambulatory Blood Pressure Monitoring (ABPM) service and a Pharmacy Strep A testing service.

The next chapter will describe two electronic recording systems that are used currently within the pharmacy sector to explore their functionality, usability and potential benefits.

## Chapter 5. Current Reality: Electronic Clinical Service Forms in Community Pharmacy

### 5.1 Introduction

As part of the research for this dissertation, the use of electronic health records within the community pharmacy sector were explored. The purpose of this chapter is to describe but not critically analyse systems that are used currently within the pharmacy sector to electronically record clinical pharmacy services. It is an exploration of current practice to gain further insight and understanding of electronic systems through recommendations and conclusions. An electronic system from both England and Ireland will be described with an emphasis on one system from each jurisdiction. From England, the system that will be described is PharmOutcomes and the system that will be discussed from Ireland is the system from the Primary Care Reimbursement Service (PCRS) vaccination portal. PharmOutcomes was chosen from the UK as it is used extensively and is often cited as a source for pharmacy data. An example of such a report is *“The value of community pharmacy – detailed report”* (PSNC, 2016). The only two platforms to electronically record clinical pharmacy services in Ireland are the PCRS vaccination portal and IPU NET (Irish Pharmacy Union). The PCRS vaccination portal was chosen as the system to describe as it is undoubtedly the most common system used in Ireland for electronically recording vaccination services. Information about both systems is widely available online.

### 5.2 English System: PharmOutcomes

#### 5.2.1 Introduction

Based on the results of the literature review, there are a range of providers offering web-based systems in England for electronically recording clinical pharmacy services. Some of the main providers of such systems include: PharmOutcomes, Webstar, North 51 and Sonar Informatics. For the purposes of this research, PharmOutcomes was the system chosen to explore and discuss. PharmOutcomes was chosen from England as it is used extensively, is often cited used as a source for community pharmacy data and was endorsed by an interviewee who operates at a senior level within community pharmacy IT services in England.

Before describing the PharmOutcomes system for electronically recording clinical pharmacy services, it is important to consider the context in which pharmacy services are provided in England. The NHS (National Health Service) Community Pharmacy Contractual Framework (contract) consists of three levels of services: essential services, advanced services and enhanced and locally commissioned services. Essential services must be provided by pharmacy owners but they can choose whether they wish to provide advanced and enhanced services (PSNC, 2017b). As a result, not all pharmacies in England offer the same pharmacy services.

Essential services include services such as dispensing and repeat dispensing, promotion of healthy lifestyles, disposal of unwanted medicines, clinical governance, support for self-care. Advanced services include services such as medicines use review (MUR), prescription intervention service, new medicine service, stoma appliance customisation service and appliance use review service.

Enhanced and locally commissioned services are commissioned by NHS England's local teams, Clinical Commissioning Groups (CCGs) and Local Authorities. As a result, there are many different services that are operating throughout England which reflect the varying needs of populations in different geographical areas. As previously mentioned, locally commissioned services are not mandatory and so are not provided universally throughout England. Examples of locally commissioned services include: emergency hormonal contraception services, screening services (e.g. for diabetes, chlamydia, high blood pressure), anticoagulation monitoring and phlebotomy services, smoking cessation services, palliative care services, care home services, supervised consumption services (e.g. methadone), vaccination services and provision of needle exchange schemes (PSNC, 2017a).

### 5.2.2 Description of PharmOutcomes

PharmOutcomes is a web-based system provided by Pinnacle Health LLP in partnership with the Pharmaceutical Services Negotiating Committee (PSNC) in the UK (PharmOutcomes, 2017). Pharmacy teams record their locally commissioned services on the PharmOutcomes system, which is then used as a database to collate information on pharmacy services.

Some pharmacy services that can be recorded electronically using the PharmOutcomes system include: influenza vaccination service, NHS health checks, chlamydia treatment, emergency

hormonal contraception, smoking cessation, needle and syringe programme, supervised consumption (methadone), minor ailment service (e.g. treatment for bacterial conjunctivitis, impetigo, urinary tract infection) and targeted medicine usage reviews (MURs). A pharmacy team can use PharmOutcomes to record their locally commissioned services as well as using a national template for common services. Pharmacy services can be edited to meet specific local service needs or they will simply work ‘out of the box’ as they are (PSNC, 2017c).

Some of the beneficial features of the PharmOutcomes system will be described below, using elements of how an influenza vaccine is electronically recorded to demonstrate.

To begin with a pharmacist using the PharmOutcomes system has the same login details which can be used across multiple pharmacies which, in the opinion of the researcher, is beneficial. Once logged into the system, only services that the pharmacist has been accredited to deliver are available to select which, in the opinion of the researcher, is beneficial from a governance perspective.

The PharmOutcomes system has a useful search facility for the postcode field when entering patient’s details. This search facility which will show the addresses at that postcode, a functionality that is not available on the Irish PCRS vaccination portal when entering vaccination data. This is a beneficial function as it has the potential to improve the quality of data entered. The NHS number of the patient can then be entered. This number can be used to correctly identify patients. The system will also accept the term ‘unknown’ if neither the patient nor the pharmacist knows the number.

The GP practice name must be entered for all vaccinations delivered. The correct GP can be chosen from the drop-down menu as shown below in figure 5.1. Again, this is a functionality that is not available on the PCRS vaccination portal when entering vaccination data. This is a useful functionality as it has the potential to mitigate against incorrect GP data being entered manually. The PharmOutcomes system has a GP notification functionality which will be described subsequently.

Please enter the name of the GP practice

NB: Practices with two split sites or branch surgeries are listed under the main practice site only. You can search using the practice code if you are unsure of the main practice site.

For those in risk groups that are not registered with a GP Practice, enter "Not Registered" in the field below, an option will appear for selection.

GP Practice

- Camhs Whitestone Clinic, Magyar Crescent, Whitestone, Nuneaton CV11 4SG (Y02256)
- Children'S Ld Whitestone, Whitestone Clinic, Magyar Crescent, Nuneaton CV11 4SG (Y03365)**
- Countesthorpe Health Centre, Central Street, Countesthorpe, Leicestershire LE8 5QJ (C82002)
- Durham Test GP, Durham Test GP TEST (TEST)
- St Michaels Hospice, Bartestree, Herefordshire HR1 4HA (M81631)
- Test Weatherwise Pinnacle Pseudo-Surgery, 1st Floor, Well Road, East Cowes, Isle of Wight PO32 6SP (Z99999)
- Testvale Surgery, 12 Salisbury Road, Totton, Southampton, Hampshire SO40 3PY (J82132)

**Patient's emergency**

Do you have details of a person's emergency contact?

Emergency contact

**Patient consent**

- I agree to be given a flu vaccination by a trained pharmacist
- I confirm that I have not already received a flu vaccination for this flu season
- I declare that the information I have given on this form is correct and complete
- I consent to the disclosure of relevant information, where appropriate from this form to:
  - my GP practice to help them provide care to me, and
  - NHS England (The national NHS body that manages pharmacy and other health services) and the NHS BSA for the purposes of checking payments to the pharmacy and to allow them to make sure the service is being provided properly

Figure 5.1: 'GP Practice entry' section of record

For vaccination delivery, a pharmacist must obtain consent from the patient. Answering 'No' to the patient consent question on the system means that the pharmacist will not be able to save any data or continue with the service for this patient as consent must be given to proceed. Text will appear in red (figure 5.2) to alert the pharmacist that consent is required to proceed. Answering 'Yes' to consent will allow the pharmacist to proceed with the service. This is a valuable function of the system as it reminds pharmacists to obtain consent.

**Patient consent**

- I agree to be given a flu vaccination by a trained pharmacist
- I confirm that I have not already received a flu vaccination for this flu season
- I declare that the information I have given on this form is correct and complete
- I consent to the disclosure of relevant information, where appropriate from this form to:
  - my GP practice to help them provide care to me, and
  - NHS England (The national NHS body that manages pharmacy and other health services) and the NHS BSA for the purposes of checking payments to the pharmacy and to allow them to make sure the service is being provided properly

Patient consent  Yes  No

A patient signature is required. You will be able to print a consent form after saving data, a link will appear to the form

You will not be able to save or test if you select Yes

**You cannot vaccinate without consent. Advise patient/carer about the protective effects of the vaccine, the risks of infection and potential complications**

Figure 5.2: 'Patient Consent' section of record

The PharmOutcomes system provides a text field so that data may be recorded for patient allergies (figure 5.3), a functionality that is not available on the Irish PCRS vaccination portal. A useful pop up box is also available which provides additional information on egg allergies for the healthcare provider.

Figure 5.3: 'Patient Allergies' section of record

Part of the consultation record that must be completed by the pharmacist is the 'exclusions and cautions' section of the record. If any of the exclusion criteria apply and the pharmacist answers 'No', then the pharmacist cannot proceed with the service – red text is displayed on the electronic form alerting the pharmacist not to vaccinate this patient as shown in figure 5.4 below, again another beneficial function of the system. Answering 'None of the above' allows the pharmacist to continue with the service. Pop up boxes are also available in this section for additional information to aid the pharmacist. In the opinion of the researcher, a pharmacist, the ability of the system to provide clinical decision support as described is an extremely beneficial and valuable function of the system.

Figure 5.4: 'Exclusions and cautions' section of record

This clinical support functionality continues for the ‘Any reported egg allergy?’ question – if the pharmacist answers ‘Yes’ in this field then the form will only display a list of restricted vaccines that are available for this patient (figure 5.5). This is a very useful support for the pharmacist.

Caution if client has egg allergy

Reported egg allergy?  Yes  No

**Vaccination details**

**Egg Allergy**  
 NB: With the exception to those who report severe anaphylaxis to eggs (see note in exclusions), individuals with less severe egg allergy can be immunised using inactivated influenza vaccine with ovalbumin content less than 0.12 mcg/ml. These are shown in the vaccine list below. If you do not have any of this vaccine type please refer patient.

Select vaccine type used

- Fluartix Tetra - Split virion inactivated virus (GSK)
- Inactivated Influenza Vaccine (Split virion) BP - (MASTA)
- Inactivated Influenza Vaccine (Split virion) BP (SanofiMSD)

**Advice to patient - The following points should be discussed**

Advice provided - Tick to indicate discussion

- Vaccine is specific to influenza and will not protect against other viruses that cause respiratory disease
- Effect of immunosuppression  
Individuals may not make a full immune response to vaccine
- Side effects - Erythema, induration and site pain  
Less common anaphylaxis
- Advise on action to take if adverse reaction
- Advise when next dose is due  
I.e. Single immunisation for each annual influenza season
- Provide patient information leaflet - See link in side box
- If administration is postponed, advise when to return

**Patient Leaflet**

Download the relevant patient information leaflet below:

- Fluarix Tetra here
- Inuvac distributed by Masta here
- Influvac (Mylan/BGP) here
- Inuvac (Mylan/BGP) here
- Inactivated influenza vaccine (Pfizer) here
- Endria here
- Agrippal here

Figure 5.5: ‘Restricted vaccine list’ for patients with egg allergies

If no egg allergy is reported the full list of vaccines will appear for the pharmacist to select from. The patient information leaflet (PIL) for each vaccine is also available as a box up information box which is an extremely valuable resource for pharmacists. The system also provides a field to record any notes or immediate adverse effects. Additional information regarding route of vaccination delivery and adverse reactions is also available to the pharmacist as pop up information boxes in that section of the record.

At the end of the service, a checklist is included as an aid to the pharmacist which provides certain pieces of advice to the patient. These can be ticked when completed which is both useful and convenient. Once all the relevant information has been recorded, the data for the service can be saved. Once saved, a confirmation box is displayed shown in below figure 5.6. This contains links to various service documents: GP Notification Letter, Patient Consent Form and Patient Questionnaire which again are both beneficial and convenient for the pharmacist. By

clicking the link on the Patient Consent Form, the document can then be printed for the patient to sign.

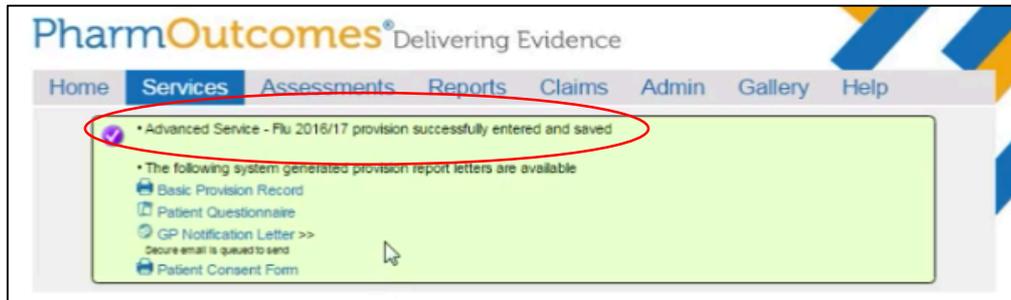


Figure 5.6: Final screen of record

As previously mentioned, the PharmOutcomes system has a GP notification functionality which is not available on the Irish PCRS vaccination portal. On selection of the required GP practice, a green alert will be visible on screen (figure 5.7). This alerts the pharmacist that this GP practice email has been verified and that notification of vaccination delivery will automatically be sent to the GP practice by email at the end of the service. Irish pharmacists are legally required to send a copy of the vaccination details to the patient's GP within seven days of administration (PSI, 2016c). Without the above functionality of GP notification, each paper-based consultation record in Ireland needs to be faxed to each GP to provide notification. The GP notification functionality is an extremely useful feature of the PharmOutcomes system.

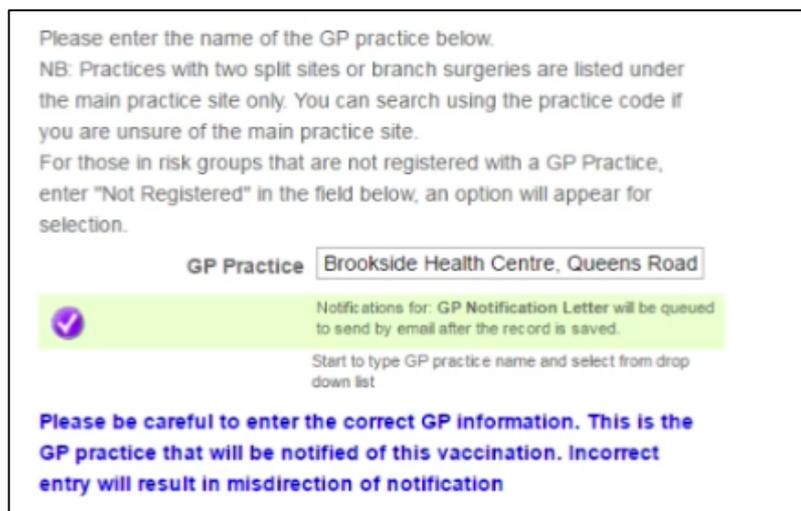


Figure 5.7: 'Green alert' for GP notification functionality

Conversely, a yellow alert is displayed when a GP practice that has not provided a secure email is entered. This alerts the pharmacist to print and send the GP notification letter manually after

the vaccination has been completed as it will not be sent automatically. The pharmacist can clearly see, as shown in figure 5.8, that the GP notification letter that has been clicked and printed.



Figure 5.8: 'GP notification letter' information on record

Another key element to the functionality of the PharmOutcomes system is that the system automatically processes the month end information and sends the claim to the relevant NHS England area for that pharmacy. A copy of the invoice can be downloaded from PharmOutcomes system by the pharmacy team. Pharmacy teams therefore do not have to 'submit' their claims at the end of the month. The system will use the live data and, on the correct day of the month will process the pharmacy records and generate the monthly invoice automatically (PharmOutcomes, 2017), improving efficiencies and workflow.

The PharmOutcomes system can also provide instant feedback to pharmacists as the system works in real-time. It has a function that allows the service commissioners to send the pharmacy a message (e.g. update on service requirements) which will be available when the pharmacy team log on to the system. The system also has the functionality to alert the commissioners when the message has been read and actioned by the pharmacy team (PSNC, 2012).

### 5.2.3 Discussion

It is apparent from describing the PharmOutcomes system that the developer designed a system that is user-friendly, logical and that provides clinical support, for example through the provision of information boxes for PILs (patient information leaflets). The questioning is responsive and the system has the ability to produce efficiencies for the pharmacist (e.g. the GP notification functionality). The system can collate a database of clinical information for statistical analysis. This can be demonstrated by the report produced by PWC on "*The value of community pharmacy*" which can cite figures such as "*the total number of EHC (emergency*

*hormonal contraception) supplies by community pharmacies in 2015 was 375,000*” and “*the total number of IDUs (injecting drug users) who used NSPs (needle and syringe programmes) in community pharmacies in 2015 in England was 234,823*” both of which are based on information recorded on the PharmOutcomes database (PSNC, 2016). Local Pharmaceutical Committees (LPCs) were asked for their views on the need for electronic data capture for pharmacy services and over 95% of respondents felt it was either important or essential and 75% responded said it should be led by community pharmacy.

#### 5.2.4 Conclusion

From the perspective of the researcher, who is a pharmacist with extensive experience of delivering clinical services in practice, the PharmOutcomes system would be highly aligned with current work flow and efficiencies in Ireland. Having a system like PharmOutcomes, can help to support the aggregation of valuable pharmacy data on a national level. This aggregated data is a rich source of observational, longitudinal and clinical data that can be used to improve patient care, to demonstrate the economic value of using pharmacists to provide clinical services and for the purposes of research.

### 5.3 Irish System: PCRS Vaccination Portal

#### 5.3.1 Introduction

In Ireland, during the 2013/14 season, pharmacies provided the flu vaccination services to over 40,115 patients. This increased to 53,047 patients during the 2014/15 season (HSE, 2017e, IPU, 2014a). Pharmacists vaccination accounts for approximately 10% of the total population immunisation (PSI, 2016a). The regulations require that a copy of the details of every vaccine administered (public or private) is forwarded to the HSE within seven days of the administration (PSI, 2016c). The Primary Care Reimbursement Service (PCRS) is part of the HSE and is responsible for making payments to healthcare professionals, like doctors, dentists and pharmacists (HSE, 2017d). The primary function of the PCRS system is reimbursement and as a record of vaccinations administered. The PCRS has an online service for pharmacists to enter all details of vaccinations administered. The researcher will provide an overview of this system in section 5.3.2 below.

Before describing the PCRS vaccination portal for electronically recording vaccinations in Ireland, it is important to outline the process before entry onto the system.

For example when a patient arrives for their influenza vaccination appointment, the current process is that all details are completed on a paper-based consultation record (see Appendix A - Winter Flu Vaccination Consultation Record). All the details from the paper-based form are then entered on the patient medication record or PMR so that the vaccine can be dispensed (PMRs are IT systems that vary in scope and functionality but primarily serve to record and store all data relating to medications dispensed to patients). Before the pharmacist can vaccinate the patient, the patient’s information (the same information that is recorded on the paper-based form and in the PMR) must be entered on the PCRS vaccination portal to check as to whether the patient has already received the vaccine from another healthcare provider for that influenza season. Once the previous vaccine entry for the patient has been checked the pharmacist can then proceed with the vaccination.

### 5.3.2 Description of the PCRS Vaccination Portal

Once the pharmacist has administered the vaccination, or as soon as practical after the consultation, the required details need to be filled in on the PCRS vaccination portal (i.e. sent to the HSE). This should ideally be completed on the same day but legally this must be done within 7 days (PSI, 2016c). The PCRS system can be accessed by logging onto the online services page at [www.pcrs.ie](http://www.pcrs.ie) and to the section entitled ‘Services for Pharmacies Only’. Pharmacists or pharmacy team members can then access the ‘Pharmacy Application Suite’ and the ‘Claiming’ section by clicking on the links as shown in figure 5.9 below. The pharmacy must have a valid ‘in date’ PCRS security certificate installed on their computer to use the PCRS system.

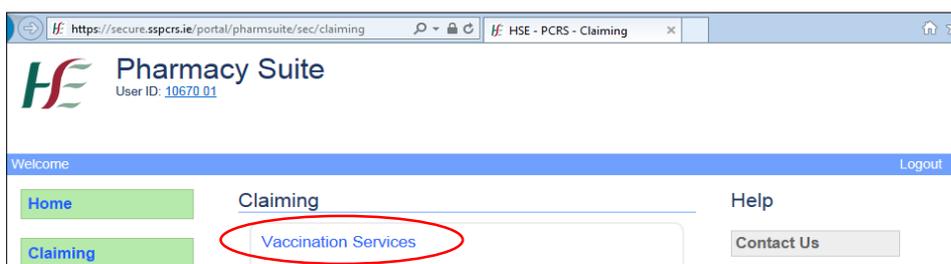


Figure 5.9: ‘Vaccination Services’

Figure 5.10: 'Identity Patient' section of the PCRS vaccination portal

Details that need be recorded include: patient's name, gender, address and PPS number (figure 5.10) (if provided) and name and address of the patient's GP (if provided), 'unknown' can be entered for GP. Once these details have been entered, the pharmacist can proceed to the next section. Unlike the PharmOutcomes system, there are no postcode or GP search functionalities available.

A report from HIQA recommended that the current PPS Number should not be used as the identifier for health and social care with the PPS number failing on eight of the 25 fundamental criteria for a safe health identifier (HIQA, 2009). The researcher agrees that the PPS number is not an appropriate identifier for healthcare, in her experience many patients are reluctant and unwilling to give their PPS details. This, she feels, is because the PPS number is used to access various services across the Irish public sector. The provision of an Individual Health Identifier (IHI) for individuals who have used, who are using or who may use a health or social care service in Ireland was identified as a key enabler for '*eHealth Strategy for Ireland December 2013*' (eHealth Ireland, 2017c). The commencement order for the IHI was signed on Tuesday, 30<sup>th</sup> May 2017 which allows for its operational use throughout the healthcare system in Ireland (eHealth Ireland, 2017b). This signifies an important step in the digitisation of Ireland's health service.

As with the PharmOutcomes system, a pharmacist must enter all the vaccination details. Unlike the English system, there are no additional information boxes for allergies, PILs, etc. to support the pharmacist with vaccination delivery.

Details from previous influenza vaccinations are also saved on the system and this information is available to the pharmacist. This can be seen in figure 5.11 below. This is a beneficial function as it allows pharmacists to check whether patients have previously had, for example, the influenza vaccine for that season. This field is located towards the end of the record and should, in the opinion of the researcher, be at the beginning of the record. The location towards the top of the record would improve efficiencies and reduce time wasting if it transpired that the patient had previously been vaccinated for that season.

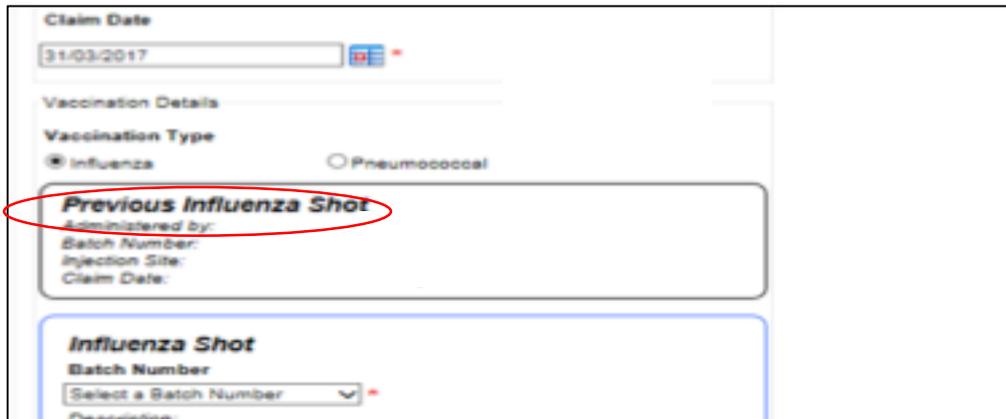
The image shows a screenshot of a web-based form for recording a vaccination. At the top, there is a 'Claim Date' field with the value '31-03-2017'. Below this is the 'Vaccination Details' section. Under 'Vaccination Type', there are two radio buttons: 'Influenza' (which is selected) and 'Pneumococcal'. Below the radio buttons is a red-bordered box containing the text 'Previous Influenza Shot' in bold, followed by 'Administered by:', 'Batch Number:', 'Injection Site:', and 'Claim Date:'. This entire box is circled in red. Below this is another section for 'Influenza Shot' with a 'Batch Number' dropdown menu showing 'Select a Batch Number' and a 'Description' field.

Figure 5.11: 'Previous Influenza Shot' information

In the last step, an acknowledgement screen must be ticked to complete the data submission process. Unlike the PharmOutcomes system, there is no checklist included as an aid to the pharmacist on completion, which would be both useful and convenient.

For patients who are eligible for free vaccine, the PCRS vaccination portal generates a request for payment for pharmacist administration of vaccination services, where applicable and the 'Claim status' for such vaccinations can be viewed (figure 5.12). Pharmacists (and GPs) must use this PCRS site for payment - manual paper claiming for vaccination services is not available.

Filter by date: All

Search:

Claim Number	PPSN	Submission Date	Patient Name	Claim Status	Claim Type		
		15/03/2017 19:48:40		Complete Service	Influenza		
		01/03/2017 16:32:44		Complete Service	Influenza		
		23/02/2017 14:56:54		Complete Service	Influenza		
		03/02/2017 16:54:29		Incomplete Service	Influenza		

Figure 5.12: 'Claim status' of PCRS vaccination portal

It is also worth noting that, for patients who are not eligible for free vaccine administration, details must still be recorded on the PCRS vaccination portal as this is a means of sending information to the HSE. For a vaccine not included on the PCRS vaccination portal, e.g. shingles vaccine, it is necessary to send this information to the PCRS by fax. If the PCRS web browser is unavailable, or the patient does not provide a PPS number, the HSE still needs to be notified via fax. Due to the nature of patients not wanting to supply PPS numbers, in the experience of the researcher, faxing to the HSE is, and continues to be, a very onerous task.

All Irish pharmacists are legally required to send a copy of the vaccination details to the patient's GP within seven days of administration (PSI, 2016c). This means that the paper-based records with such details must be faxed to each GP within this time period. However, a potential solution for the onerous task of faxing is imminent with the introduction of Healthmail. Healthmail is a secure clinical email system provided by the Office of the Chief Information Officer in the HSE. It will allow healthcare providers to send and receive patient identifiable clinical information in a secure manner. Some of the functionalities that maybe useful for pharmacists include: notification to a patient's GP of vaccination and exchange of patient records between pharmacies and prescription clarification (Healthmail, 2017).

### 5.3.3 Discussion

The primary function of the PCRS system is reimbursement and as a record of vaccinations administered. Compared to the PharmOutcomes system, it does not provide any clinical decision support nor any alerts functionality for pharmacists. There are no ‘information boxes’ to assist the healthcare provider and there is no functionality for GP notification of vaccination. For healthcare providers, there are multiple points of duplication of work for vaccination services. All the same information is captured on the paper-based form, on the PMR and on the PCRS vaccination portal. Due to the onerous task of faxing vaccination details to the HSE each time a patient does not provide their PPS number, the researcher believes that the imminent introduction of the IHI, as discussed previously, will promote efficiencies with the Irish health service for providers of healthcare such as pharmacists.

It is clear to the researcher that the motivation for the PCRS vaccination portal is reimbursement and as a record of vaccinations administered only and as such does not provide any of the functionalities such as clinical decision support, etc. for users.

### 5.4 Conclusion

This chapter described two systems that are used currently for electronically recording clinical pharmacy services. The two systems that were described were the PharmOutcomes system in England and the PCRS vaccination portal in Ireland. Describing and exploring these systems was both beneficial and insightful. Although the exercise was not a critical appraisal of the systems, this exploration of current practice provided insights for the future design and development of electronic recording systems for clinical pharmacy service consultations within community pharmacy in Ireland.

The next chapter, chapter 6, shall evaluate and analyse the results of the of the semi-structured interviews and will endeavour to answer the research questions by analysing and discussing the results and conclusions from the previous chapters.

## Chapter 6. Findings and Discussion

*“Qualitative data analysis involves organising, accounting for and explaining the data; in short, making sense of data in terms of the participants’ definitions of the situation, noting patterns, themes, categories and regularities.” (Cohen, 2011)*

### 6.1 Introduction

This chapter describes the steps taken to analyse the narrative data of the semi-structured interviews which were conducted to explore the potential benefits and challenges of digitising clinical service records in community pharmacy. The qualitative data will also be analysed in conjunction with information presented in chapters 4 and 5 and in addition to the literature review. Quotations from the research interviews are included, where relevant, to emphasise the views of the interviewees.

### 6.2 Semi-Structured Interviews

Eight people were invited to participate and eight accepted. Interviews were carried out from April to May 2017. Handwritten notes were taken at all interviews in addition to all interviews being recorded. The researcher created a transcript for each interview, based on the interview field notes and the interview recordings. Semi-structured interviews were performed where five questions were used, 5 of which were pre-determined based on the analysis of the literature and three that emerged during the exploratory phase of the interview. The results will be presented in two sections drawing in the analyses for chapters 4 and 5 in addition to the literature review:

- the first section will discuss and analyse the benefits of digitising clinical service records in community pharmacy.
- the second section will seek to understand the challenges of digitising clinical service records in community pharmacy.

### 6.3 Qualitative Data Analysis

The research questions to be answered in this dissertation were:

- What are the potential benefits of digitising clinical service records in community pharmacy?
- What are the challenges for digitising clinical service records in community pharmacy?

A large quantity of data was collected from the literature review, field notes and interviews conducted. The field notes and transcribed interviews were analysed and coded to identify recurring topics. Themes and sub-themes were then identified from analysis of the coded information and based on the findings of the literature review. The researcher used an inductive approach to the analysis, using the literature as an aid to identify topics and subsequently themes and sub-themes that emerged from the data. The topics, themes and sub-themes discovered during the analysis are shown in Table 6.1 below.

Table 6.1 Overview of the topics, themes and sub-themes discovered

Topics	Themes	Sub-theme
<b>Potential Benefits</b>	Data quality improvement	Incomplete/missing data Data quality for research
	Improvement in quality of care and patient safety	
	Increased efficiencies and productivity	Operational benefits
	Potential for research	Patient outcomes Sharing of records
	Availability of clinical decision support	
<b>Challenges</b>	Resistance to change	Incentives
	Integration and Interoperability	Cost
	Loss of productivity and workflow	
	Cost	
	Usability	Design and development
	Consent, confidentiality and security	

## 6.4 Qualitative Data Results

Firstly, it is important and interesting to note that all participants interviewed believed it would be beneficial to digitise clinical pharmacy service records. Some of these quotations are shown in box 1 below.

### Box 1: Interview quotations on “Is it beneficial to digitise clinical pharmacy service records?”

*“Yes, absolutely because of longitudinal data and for continuity of patient care.” I1*

*“Yes, it would be a huge resource for patient’s, GPs and researchers.” I2*

*“Absolutely – Digitisation of patient data captured in the pharmacy is a key step to sharing and integrating patient clinical data across all care settings to improve patient care and cost effective medicines management and clinical decision making using the most up to date information available.” I3*

*“Yes, from clinical perspective, it’s very important in terms of keeping that consultation record. You have documented consent and you evidence of that also.” I4*

*“Hugely important, but the important thing is having quality data in there, across the whole episode of care that’s needed.” I5*

### 6.4.1 Benefits of Digitising Clinical Service Records in Community Pharmacy

In answer to the research question, there are many potential benefits to digitising clinical service records in community pharmacy. Some of the potential benefits that were listed in the literature (section 2.10) and that are mirrored in the responses from the interviewees include, improvement in the quality of data collected, improvement in quality of care and patient safety, increased efficiencies and productivity for users, the ability to mine data for research purposes and the ability of a digital record to offer clinical decision support to healthcare providers. Each of these potential benefits will be discussed below.

#### 6.4.1.1 Improvement in the Quality of Data

Quality data can be defined as reliable data, available in a timely manner to decision makers who can confidently rely on it (HIQA, 2012c). The “*collect once, use many times*” theory of data reuse is advocated as a way towards a national health information strategy (Barton et al., 2011), with HIQA also emphasising the value of collecting information once and as near to the point of care as possible (HIQA, 2017). The literature cites numerous examples of paper-based records that are incomplete, inaccurate and illegible (Young et al., 1998, Hippisley-Cox et al.,

2003, Carroll et al., 2003, Hogan and Wagner, 1997, Berg, 2003, Winslow et al., 1997). The quality of paper records is also discussed in section 2.9 of the literature review.

Analysis of a sample of paper-based records from two clinical pharmacy services was carried out in chapter 4 of this research. This analysis demonstrated significant amounts of incomplete or missing records. In relation to cardiovascular data for the paper-based record for the ABPM service, there was 93.6% of data missing for the first cardiovascular question and 85% missing for the second cardiovascular question. 1.5% of the data pertaining to the diabetes question was missing/incomplete, 2% of the data relating to the cholesterol question was missing/incomplete and 5% of the data relating to patients' medication was missing or incomplete. This compares to no data missing from the ABPM results which are electronically generated as discussed in section 4.2.4.3. There were also substantial amounts of missing/incomplete records from the second service analysed, the pharmacy Strep A service. For example, 5% of the gender data was missing/incomplete, 37% of the patient age data was missing/incomplete, 5% of the data regarding the fever question and 4% regarding the cough question was also either missing or incomplete.

The PharmOutcomes system as described in chapter 5 has a useful search facility for both the GP practice and postcode field when entering patient's details. This is a beneficial function as it has the potential to improve the quality of data entered. This system also identifies patients using their NHS number which is a specific health identifier. This number can be used to correctly identify patients, again improving the quality of data entered.

Three interviewees mentioned data quality (see box 2) as a potential benefit of digitising clinical service records in community pharmacy. Interestingly, all three were concerned with data quality for research purposes, though only one of these interviewees is a researcher.

## Box 2: Interview quotations on data quality

*“Paper-based forms are designed so that the form has all the information that is relevant for that service on it, all those questions should be asked and all should be answered. In practice, some questions might be answered verbally but not on the form, this leads to incomplete records, which are widespread. On an electronic form, someone is forced to answer and can’t move through so you can’t have those missing gaps. Incomplete data has implications from a research perspective and could affect the integrity of the data.” I4*

*“There will be lack of confidence with the data if the quality is poor which would potentially lead to a lack of trust in researchers using it.” I5*

*“As a researcher, the quality of the data is very important to me, if I can’t trust it, I won’t use it.” I2*

### 6.4.1.2 Improved Quality of Care and Patient Safety

As we have seen in the previous section on data quality, paper records have been heavily criticised for their limited accessibility and their “*general incompleteness*”, with studies showing the information from paper records as vague, illegible and ambiguous (Berg, 2003). It has been shown that patient safety is increased and efficiencies are improved because of digitisation. Section 2.4 discusses the benefits of digitisation in terms of patient safety for CPOE with systematic reviews showing that CPOE significantly decreases medication error rates and ADRs. The ability of an electronic system to allow data sharing between healthcare professionals would potentially enable healthcare professionals to treat patients with the knowledge that the electronic health records that they possess are accurate, concise and up to date. This would lead to improved quality of care and patient safety. The electronic transfer of information between health professionals has the potential to lead to better clinical decision-making, resulting in a safer and higher quality of patient care.

Three of the eight participants interviewed commented on an improved in quality of care and patient safety as a benefit of digitisation (see box 3), one interviewee, a pharmacist (I4) and two are health researchers (I8, I2).

### Box 3: Interview quotations on quality of care and patient safety

*“You’re collecting a lot of observational data that you could use on a population. It tells you something about the people that are coming into pharmacy to get the service and that may be of use to others who either would like to develop similar services or understand the types of people that are coming to pharmacy and better design the service for those types of individuals. It ultimately comes down to improving patient care.” I4*

*“Research is done to improve quality of care, digitisation facilitates with linkage and without linkage there’s no point, if we can’t link data we can’t ever look at outcomes or we can’t look at other risk factors, we can’t look at confounders.” I8*

*“In addition to general benefits of digital records, digitising clinical service record forms would be very beneficial for patients by streamlining part of their care process and for care teams for being able to capture a better image of patient's state of health.” I2*

#### 6.4.1.3 Increased Efficiencies and Productivity

The ideal situation would be to have patient information available when it is required, where it is required and for whom requires it. The ability of pharmacists, and indeed all healthcare providers, to have electronic records has the potential to lead to quicker access to patient information leading to increased efficiencies and productivity (Hoyt, 2014). It is also proposed that electronic records may increase efficiencies and productivity as they are paperless and therefore may streamline several routine tasks (Goundrey-Smith, 2012).

As demonstrated in chapter 5, pharmacists currently document the same information numerous times (on the paper-based record, on the PMR and on the PCRS vaccination portal) when completing a vaccination service in Ireland. A digital record produced on an electronic recording system which could potentially link to the pharmacy dispensing system (PMR) would free up time by eliminating the need for duplicate records to be held. This would have operational benefits in terms of streamlining workflow and saving time leading to increased efficiencies and productivity. Updates to the electronic pharmacy service forms could potentially be completed electronically and pushed out to pharmacies when approved. This would reduce timelines for updates and ensure pharmacy teams are always using the most up to date version of the consultation record. Additionally, a digital record may increase efficiencies as these records are paperless and therefore may simplify several routine tasks such as ordering, printing and filing. Pharmacists in Ireland are subject to using the fax machine for

many tasks such as faxing copies of prescriptions to GPs/hospitals/dentists for verification and faxing notification of vaccinations to GPs for example. The ability to transfer and exchange records electronically and securely could potentially remove this onerous task leading to improved workflow.

As described previously, the PharmOutcomes system as described in chapter 5 has a useful search facility for both the GP practice, postcode field and NHS number when entering patient's details. This is a beneficial function as it has the potential to improve the quality of data entered but also is beneficial for the pharmacist in terms of workflow efficiencies.

Although cited in the literature, increased efficiencies and productivity were not mentioned by any of the interviewees as a potential benefit to digitisation. The researcher believes that this was not mentioned as electronic records for clinical pharmacy services in Ireland have not been extensively introduced and therefore the interviewees have no experience of this perceived benefit which is probably why it was not mentioned.

#### 6.4.1.4 Secondary Use of Data

As discussed in section 2.12 the healthcare industry is generating large volumes of data every day and it is an industry that is information and communication intensive. This is driven by record keeping, patient care, compliance and regulatory requirements. Clinical researchers are increasingly interested in the secondary use of clinical data and this is especially true with the growing availability of large electronic health record databases which contain a vast source of disease and treatment data. The healthcare industry has an increasing need for clinical data to support both patient care and data reuse to make evidence-based decisions. Data reuse or secondary use of data is essential for improving the safety, quality and efficiency of healthcare (Barton et al., 2011). While research is often not the primary motivation for collecting data, it has a significant research potential if data reuse is possible.

Chapter 4 of this dissertation described the types of data that are captured currently for two Irish clinical pharmacy services, an ABPM service and a Pharmacy Strep A testing service. That chapter illustrates the wealth of data that is currently 'locked' into paper-based consultation records within the community pharmacy and their potential use as secondary source of data. Chapter 4 only illustrated a sample of data from two pharmacy services. Pharmacies are

collecting data for many other services such as the emergency hormonal contraceptive service, the methadone service, the food intolerance testing service, the needle exchange service and many other clinical services. Pharmacies are collecting large amounts of observational and longitudinal data daily. The opinion of the researcher is that there is huge value in this data from a research perspective that is not being utilised. This observational and longitudinal data can tell a researcher something about the types of people that are attending pharmacies to avail of services. This information may be of use to others who would like to develop similar services or equally to understand the types of people that are attending pharmacies to avail of these services. This information can then be used to design a superior service for those types of individuals ultimately leading to an improvement in patient care. Currently community pharmacy paper-based records are standalone documents which lack the ability to integrate with other paper-based forms or other information sources. Additionally, these records are only retained for a period of time and after such time are destroyed along with the data. Digitising this data has the potential to improve the quality of this data as discussed in section 6.3.1 making it a valuable and assessable resource for researchers.

As discussed in chapter 5, the PharmOutcomes system, which electronically records clinical pharmacy services, has the capability to collate a database of clinical information for statistical analysis. As a result, it captures the evidence of community pharmacy's benefit for patients and is used as a tool for research.

One of the main themes that emerged from the interviewees when discussing benefits of digitisation was patient outcomes. Four of the eight interviewees mentioned that data reuse must be used to assess patient outcomes. The views of the interviewees on secondary uses of data as a benefit of digitising records are shown in box 4 below.

#### Box 4: Interview quotations on secondary uses of data as a benefit

*“Within the pharmacy itself, the longitudinal data can be very useful. In relation to 24-hour BP you can monitor patients over time. That data should be able to help to gauge the value of the intervention by the pharmacist as well as the GP. If expanded out into the boarder population of people availing of pharmacy services, if we could have all that data for all the pharmacies in Ireland, take away the personal data – we have a huge research bank.” I1*

*“Cost-effectiveness type analyses is very important in terms of being able to say what is the outcome of that service? How much does it cost? What is the value? – that kind of data is invaluable.” I4*

*“Lack of information leads to poor outcomes so the information has to be shared.” I1*

*“In addition to general benefits of digital/electronic records, digitising clinical service record forms would be very beneficial for researchers for potentially having access to a large dataset s on which they can conduct data analysis. The more data you have, the more selective you can be, you never know what you can discover from data. The more data I have the happier I am.” I2*

*“From a research perspective, you can look at the trends, for example at what point do patients feel that they should go to their pharmacy to have their blood pressure checked” I2*

*“ I think it (pharmacy) is a totally untapped resource...we (researchers) rely a lot on the PCRS but the difficulty with that is that it doesn't include private paying patients, whereas the data in pharmacy is for both public and private patients and that's important data to have” I8*

It is important to note that two of the interviewees commented on the views of patients regarding sharing of information for research purposes within community pharmacy. These comments can be seen in box 5 below.

#### Box 5: Interview quotations on sharing of records

*“From research previously completed in pharmacies, the response rates tended to be very high, 98% and upwards, I think that the public are willing to engage from a research perspective anyway with pharmacists and I do think it is because of that trusting relationship.” I8*

*“The patient has an expectation that the data is going to be shared, most patients think that we're sharing the data already but we're not.” I1*

#### 6.4.1.5 Clinical Decision Support

One of the potential benefits listed in the literature of electronic records for healthcare professionals is clinical decision support. Decision support can improve overall care quality by providing alerts and reminders to providers leading to a safer and higher quality of care for patients. One study demonstrates that clinical care was improved 94% of the time (Garg et al., 2005) due to clinical decision support. As discussed in section 2.4, numerous systematic reviews all concluded in their findings that the use of CPOE with clinical decision support significantly decreases medication error rates.

Chapter 5 discussed the PharmOutcomes system which uses clinical decision support to aid pharmacists providing clinical services. For example, in chapter 5, we saw that if a patient had an allergy to egg and the pharmacist answers ‘Yes’ to this question, then the record will only display a list of restricted vaccines that are available for this patient. Similarly, if any of the exclusion criteria apply and the pharmacist answers ‘No’, then the pharmacist cannot proceed with the service and ‘red’ text will be displayed alerting the pharmacist not to vaccinate. These are only two examples in that particular electronic record of extremely useful decision support that supports the pharmacist and is vital for ensuring patient safety. The PharmOutcomes system also provides links to clinical information that can assist the decision-making process in a convenient and timely manner. Two of the interviewees commented on the clinical decision support as a benefit of digitisation with one of the interviewees, a researcher, commenting that if research isn’t incorporated into clinical practice, then *“the research is pointless”*. The views of the interviewees on clinical decision support as a benefit of digitising records are shown in box 6 below.

#### Box 6: Interview quotations on clinical decision support as a benefit of digitisation

*“If for whatever reason a patient can’t progress through a service, the system can give the pharmacist some information either about referral to the GP or other information that maybe appropriate. It’s becoming something more than a record then, it’s also giving that pharmacist more information, becoming a tool for them, helping them make decisions.”* I4

*“It is important that the research we do is incorporated into clinical practise, is implemented in some way such as clinical decision support...unless this is done then the research is pointless”* I8

It has been speculated that as more and more CDS systems are used, patients will receive a safer level of care that is more efficient (Menachemi and Collum, 2011).

#### 6.4.1.6 Summary

Section 6.4.1 outlined the key themes that emerged from the research regarding the potential benefits of digitising clinical service records in community pharmacy. The next section will discuss the main themes that emerged regarding the challenges for digitising clinical service records in community pharmacy.

### 6.4.2 Challenges of Digitising Clinical Service Records in Community Pharmacy

In answering the research question, there are many challenges when considering digitising clinical service records in community pharmacy as found in both the literature (section 2.11) and from insights gained from the interviewees. Some of the challenges listed in the literature and which were mirrored in the interviews include: resistance to change, interoperability and integration, loss of productivity and changes to workflow, cost, security concerns, concerns regarding consent and privacy and usability. Each of these challenges will be discussed in detail below.

#### 6.4.2.1 Resistance to Change

One of the main themes that emerged from both the literature and the interviews concerning the challenges for digitising clinical service records in pharmacy was resistance to change. The literature has cited resistance to change as second only to lack of funding as the most commonly perceived obstacle to adoption of electronic records (Hoyt, 2014). When the topic was discussed with the interviewees for this research, there was mixed opinions from the pharmacists that were interviewed. One interviewee did not think that adoption of digital records for pharmacy would be of concern and another pharmacist interviewed thought that it may pose a challenge for some. These views can be seen in box 7 below.

#### Box 7: Interview quotations on resistance to change: pharmacists

*“The pharmacists themselves, some will want to do services, some won’t. Clinical pharmacy services are going to be voluntary, some will do them, some won’t. It can be a capacity issue, it can be a space issue, an attitude issue. Adopting new electronic systems can be a challenge for some people.” I1*

*“A small challenge may be adapting to change but pharmacists as a population are very responsive to change, as a profession are quite IT literate. We use computers every day so I can’t foresee it being an issue.” I4*

The literature tells us that when it comes to technology GPs need an incentive, they have to be shown that a new technology can for example, make money, save time or will have a positive outcome for their patients (Hoyt, 2014). Studies have shown that doctors are spending more time completing data entry versus direct time with patients (Block et al., 2013, Hill et al., 2013) which is a contributing factor to resistance. When discussing the challenges of digitisation one of the interviewees, a researcher with experience of GP IT systems commented (box 8):

#### Box 8: Interview quotations on resistance to change: GPs

*“If you have the perfect system technically, the challenge would be would people use it? One of the things that I observed with GPs is that they don’t use the system until they have to. They want to know if they are getting a reward for using it. Rewards such the ability to do end of year audits from the system – these rewards encouraged them to use it.” I2*

*“When deploying a system for clinical prediction rules, the GPs would ask ‘Why would I use it?’, ‘What will it tell me?’, ‘Is it trying to overrule me, does that mean I don’t know what I’m talking about?’” I2*

Some of the main reasons cited for resistance to change include the perception of increased demands for data entry and interruption to work flow with accompanying loss of time. The opinion of the researcher is if a system for electronically recording clinical pharmacy was introduced it would have to show a real and tangible benefit for the pharmacists using the system. Such benefits would have to include operational benefits such as reduction in duplication of records, time-saving benefit, functionality to provide clinical decision support, the ability to mine the data for research purposes. The ability of a system to have real and tangible benefits such as those listed would, in the researcher’s opinion, reduce the amount of ensuing resistance. Operational benefits are enormously important and are absolutely an

incentive for some users, including the researcher. It was noted during a discussion with one of the interviewees that other incentives, such as the ones mentioned in the quotation below, may also support the implementation of a project.

#### Box 9: Interview quotations on incentives

*“The incentive has to be there for the users. That incentive can be different for individuals. The incentive can be improved reimbursement for some. In the UK for example, with NHS mail, you were fined if you didn’t use it. It’s a different type of incentive but it worked. In Estonia, GPs didn’t get paid if they didn’t use ePrescribing.” I6*

It is important, and has been noted in the literature, that clinical engagement is crucial for the successful delivery of eHealth in Ireland (eHealth Ireland, 2015). This was echoed by one of the interviewees who commented (box 10):

#### Box 10: Interview quotations on clinical engagement

*“You need to sell the benefits of the system, you need a clinical lead that will champion the system. You need to bring people with you, a clinical lead can do that.” I5*

### 6.4.2.2 Interoperability and Integration

Interoperability describes *“the extent to which systems and devices can exchange data, and interpret that shared data. For two systems to be interoperable, they must be able to exchange data and subsequently present that data such that it can be understood by a user”* (HIMSS, 2016). Integration with other systems and lack of standards for interoperability are cited in the literature as a challenge to the adoption of electronic health records. Many surgeries and hospitals have multiple old legacy systems that do not talk to each other which can present as a challenge to adoption (Hoyt, 2014). Community pharmacy is no different regarding integration - the PMR system where all dispensing data is recorded presents as a perpetual problem in its inability to integrate with other technology. This will pose a challenge for the integration of an electronic system for recording clinical services but it is a challenge that must be overcome.

As discussed in chapter 5, when considering the flu vaccination service for example, pharmacists are required to enter the same data multiple times. All the same information is captured on the paper-based form, on the PMR and on the PCRS vaccination portal. HIQA’s

mantra is “*record once, use many times*” (HIQA, 2017) which was echoed by one of the interviewees as shown below in box 11.

#### Box 11: Interview quotations on integration

*“If you have standalone systems, that’s not going to work. To me the most important thing is having standards in place which are agreed. Then you’re getting into implementing those standards using recognised interfaces. If you invest in it the end users will only have to record it once, they won’t have to frustrating log into multiple systems to record the same data.” I5*

A real and tangible challenge for pharmacy will be integration with both the PMR and the PCRS vaccination portal to enable single data entry. This will involve discussion with the PMR vendors to find a solution that is both achievable and solution-driven. Digitising clinical records in pharmacy in Ireland is a new and niche area and as such is not a priority for PMR vendors at present. This is another challenge that must be overcome. Cost has been cited in the literature as a challenge to adoption, this will be discussed further in section 6.4.2.4 but it is important to note that integration of a new electronic system with old legacy systems could potentially be costly. When discussing the challenge of interoperability and integration with the interviewees, the following quotations in box 12 were their thoughts.

#### Box 12: Interview quotations on interoperability and integration

*“There is the whole issue of integrating with the PMR or not. PMRs tend to be closed systems. It’s a big challenge.” I1*

*“Two of the major challenges for electronic records are interoperability and integration. Digitising the consultation record is relatively easy.” I2*

*“Anything that we record should be able to be sent into the GP and the GP should be able to import that into his system. If we have interoperable standards, it makes it more powerful.” I1*

As mentioned previously, one of the main challenges for pharmacy will be integration with both the PMR and the PCRS vaccination portal to enable single data entry. It is promising to see that there is willingness on the part of the PCRS to participate in this connectivity. However, the barrier and challenge to this progressing will be who will pay for the integration of the PCRS to the PMR as the PCRS have indicated that this is not something they would take the cost on for (box 13).

### Box 13: Interview quotations on interoperability and integration: PCRS

*“We (PCRS) have no difficulty in principle to allow the connectivity and we have no difficulty in principle to enable it but it isn’t a high priority for us at the moment. We recognise that it makes sense for a number of different reasons, there is the opportunity for connectivity but it isn’t something we’ll take the cost on for.” I7*

The literature has also noted that successful integration of data into clinical workflow is essential to minimise disruption to workflow and unnecessary data capture. This can be achieved through the implementation of user-friendly systems (Kellerman and Jones, 2013).

#### 6.4.2.3 Loss of Productivity and Changes to Workflow

Loss of productivity and changes to workflow were cited in the literature as obstacles for adoption of electronic health records. The loss of productivity for example may be dependent on ability of the user, on the training provided for the new system (Hoyt, 2014), leading to a reduction in work capacity for some users. This loss of productivity can be in part due to changes in workflow. An estimated productivity loss of 20% in the first month was found by one study involving medical clinics followed by 10% and 5% in the subsequent two months. Productivity did subsequently return to its original levels (Wang et al., 2003). Interestingly, the findings of the interviews showed that the interviewees were not concerned about loss of productivity and changes to workflow although one of the interviewees did comment on how workflow should be designed (box 14).

### Box 14: Interview quotations on loss of productivity and changes to workflow

*We (Pharmacists) need to be mindful of how we work, how we design our workflow has to suit the patient at the end, has to add value to their experience coming in. It also has to add value to our organisation, because if we get more people coming in, we get more income, we get more revenue.” I1*

A potential reason why the interviewees might not consider the loss of productivity and/or changes to workflow as a challenge to digitisation is due to the absence of live systems for electronically recording pharmacy services in Ireland presently.

#### 6.4.2.4 Cost

Lack of funding has been reported in many studies as the primary challenge to adoption of electronic health records (Wang et al., 2003) with experts agreeing that for smaller practices the sophisticated software can be unaffordable. Other cost-prohibitive factors cited in the literature include: purchasing and installing of hardware and software, converting paper-based forms into electronic versions, staff training, maintenance costs (which may be ongoing) and loss of productivity which can potentially lead to a loss of revenue (Menachemi and Collum, 2011, Menachemi, 2006). As previously mentioned in section 6.4.2.2 the cost of integrating the PMR system to the PCRS will be a challenge. The PCRS have mentioned that they will not pay this cost (box 13), so a challenge will be to convince PMR vendors of the benefits of this integration and the value that it will add. One of the interviewees specifically commented on cost as a challenge of digitising records as shown in box 15 below.

#### Box 15: Interview quotations on cost

*“Cost will be prohibitive in certain peoples’ minds. What is the cost of an electronic solution versus a paper-based solution? Clinical services are a young area, a small field and not as revenue driving compared to for example dispensed medications. Would people invest in an electronic solution for that part of their business if they didn’t have to?” I4*

Operational benefit in terms of time savings, efficiencies, etc. will have to be shown to support in the conversation for investment of electronic records.

#### 6.4.2.5 Usability

Usability has been defined as the *“effectiveness, efficiency and satisfaction with which specific users can achieve a specific set of tasks in a particular environment”* (Boone, 2010). It has been reported that electronic healthcare systems are abandoned due to user dissatisfaction. Systems for healthcare have commonly been created ad hoc, by developers who frequently overlook relevant and important functionalities for users such as user preferences, user tasks and issues with usability. This results in systems that decrease productivity and are unusable. It has been shown that poor information displays can lead to care which is not efficient (unnecessary ordering of tests or information that is missing or unavailable when required) (Johnson et al., 2005). It is crucially important to integrate the knowledge of user-centered design into the design of any new system. This has been shown to improve both the quality of healthcare and error reduction. The literature has also noted that an important element for success is the ability

of researchers, system developers and healthcare users to work together in the design process (Johnson et al., 2005). Some studies have suggested the use of a EHR specific usability framework to facilitate adoption. Such a framework has been postulated to increase efficiency and productivity, increase user retention and satisfaction and increase ease of use and ease of learning. The framework may also decrease development time and cost, decrease support and training cost and decrease human errors (Zhang and Walji, 2011).

It was apparent from describing the PharmOutcomes system in chapter 5 that the developer designed a system that is user-friendly, logical and highly aligned with current workflows and efficiencies for pharmacists delivering clinical services.

Of the eight interviewees, only two (both pharmacists) commented on usability as a challenge to digitising records. Interestingly, both their comments refer to the importance of suitable design and usability of a system rather than comments relating to user dissatisfaction which was cited in the literature. This again presumably is because electronic systems for recording clinical pharmacy service in Ireland have not extensively been established. The views of the interviewees on usability are shown in box 16 below.

#### Box 16: Interview quotations on usability as a challenge to digitising records

*“The usability of any system is very important. The user interface that’s provided has to be friendly, has to be fast, has to respond to the user needs. It also has to have a good help functionality.” I1*

*“Design and usability are critical. When you’re at the design stage, number one you have to look at the value of the data and what you want to gain from recording that data. There has to be a reason why you are doing it, the benefits to the patient, the benefits to the clinician, the benefits to population health overall.” I1*

*“If pharmacists enjoy using the platform, they will enjoy delivering the service. The questions should make logical sense, you have the basic demographic information at the beginning, you want your exclusion high up the page so that you don’t waste time – a logical sequence.” I4*

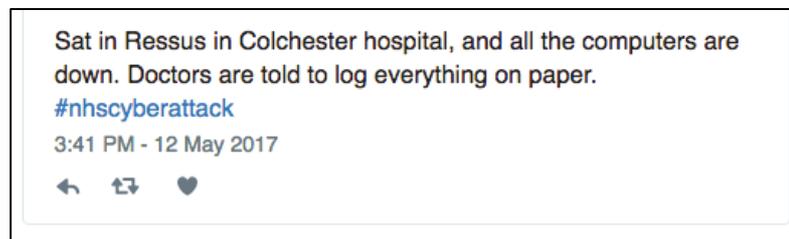
#### 6.4.2.6 Consent, Confidentiality and Security

Challenges for digitisation such as consent, confidentiality and security are commonly cited in the literature as challenges to the adoption of electronic health records. As previously mentioned, it has been shown that many healthcare professionals (especially GPs) still have

concerns about the security of electronic systems (International Pharmaceutical Federation, 2016), which will present as a challenge for widespread adoption for EHRs. However, this was not reflected by the interviewees as a challenge to digitising clinical service records in community pharmacy. Pharmacists have a duty to care to ensure that any information collected in confidence should be stored in confidence and in a secure manner. As such, consent, confidentiality and security are incorporated into the everyday role and responsibility of a pharmacist and so are inherently done. This could be a potential reason why the interviewees did not view consent, confidentiality and security as potential challenges. It is noted in the literature that electronic records do pose new potential privacy and security threats for patient data which can be mitigated against with proper technology (Hoyt, 2014).

As discussed in section 5.3.2, Healthmail is a new and imminent clinical email system which will allow healthcare providers to send and receive clinical, patient identifiable information in a secure manner. As with all new systems that are implemented, it will be essential to ensure that the issues associated with sharing patient records with other healthcare professionals, such as patient privacy violations, are mitigated against.

Cyber security is real threat which was evident with the most recent attack on May 12<sup>th</sup> (2017). Companies and organisations in almost 100 countries were affected by the cyber-attack. Hundreds of clinics and hospitals in the NHS were infected, forcing patients to attend other facilities with doctors told to *'log everything on paper'* as seen in the tweet below (Guardian, 2017).



## 6.5 Conclusion

This chapter presents the analysis of the narrative data of the semi-structured interviews and the overall findings of the research. It integrates the findings from literature review, the analyses of chapters 4 and 5 and the insights from the interviews, the purpose of which was to answer

the research questions as presented in chapter 1. The key conclusions of this research, recommendation for future research and the strengths and limitations of the research are presented in chapter 7.

## Chapter 7. Conclusion and Recommendations

### 7.1 Introduction

This final chapter concludes the dissertation. This chapter will discuss the answers to the research questions and address the strengths and limitations of the research. Recommendations and future work are also identified in this concluding chapter.

### 7.2 Answers to the Research Questions

The two research questions posed in the dissertation were:

- What are the potential benefits of digitising clinical service records in community pharmacy?
- What are the challenges for digitising clinical service records in community pharmacy?

The research found the potential benefits of digitising clinical service records in community pharmacy to be:

- Improvement in quality of care and patient safety
- Improvement in the quality of data collected
- Increased efficiencies and productivity for users
- The ability to mine data for research purposes
- The ability of a digital record to offer clinical decision support to healthcare providers

The research found the challenges to digitising clinical service records in community pharmacy to be:

- Resistance to change
- Interoperability and integration
- Loss of productivity and changes to workflow
- Cost
- Usability

- Security concerns, concerns regarding consent and privacy

The researcher believes that the methods used in this study worked well to answer the research questions that were posed.

### 7.3 Strengths of the Research

The research topic of digitising clinical service records in community pharmacy is an area that is both novel and niche and as such this research contributes to bridging the gap in the literature for this topic. A strength of this research is that it highlights the wealth of data that is ‘locked’ into community pharmacy and the potential value in digitising this data, as was demonstrated in chapter 4. It is hoped that the results of this study, and in particular chapter 4, can be used to highlight the importance and value of the data that is generated daily in community pharmacy. This research also provides a description of current practices for electronically recording clinical pharmacy services, as described in chapter 5. This is a strength of the research as this description provides the opportunity to gain further insight and understanding of electronic systems as well as providing valuable insights on how best such a system could be implemented in the future.

### 7.4 Limitations of the Research

In addition to the limitations of the research methodology adopted, as described in section 3.10, the reader may also need to consider other limitations in relation to this research. As the research questions explored an area that is both novel and niche, it was difficult to find research papers relating to electronic records specifically related to clinical pharmacy services and even specifically to electronic records in community pharmacy. This highlights that there is a lot of opportunity for further research in this area. Semi-structured interviews with relevant stakeholders within the pharmacy sector in Ireland were conducted as part of the research. The researcher was unable to interview a member of the pharmacy regulator, the Pharmaceutical Society of Ireland (PSI), to gain their views and insights on the research topic, which the researcher considers a limitation of the research.

## 7.5 Recommendations and Future Work

The findings of the research have both practical and theoretical importance as they can serve as the basis for future research on this new and novel topic for community pharmacy. As previously mentioned, clinical pharmacy services consultation records in Ireland are currently recorded on paper-based forms. Pharmacy is an industry that is information-intensive and, in the opinion of the researcher, the digitisation of clinical pharmacy services is both inevitable and imminent. Based on the findings from the interviews and knowledge gleaned from the literature, the following are some recommendations for the design, development and user requirements for a system for electronically recording clinical pharmacy services:

- Provision of a system that is user-friendly, responsive and efficient
- Ability to integrate now or the future with systems such as the PMR, the PCRS to avoid duplication of workload
- Inclusion of clinical decision support
- Ability to view documents such as standard operating procedures (SOPs), patient information leaflets (PILs)
- Ability to extract a database of clinical information for statistical analysis
- Ability to view key demographic and/or clinical characteristics in real time
- Ability to share information securely with other healthcare providers
- Allow digital signature capability when legally permitted in the Irish market
- Ability to invite patients for repeat visits for clinical pharmacy services (e.g. annual winter flu vaccination service)
- A system that is designed to work on PCs, tablets and mobile devices

One of the key motivations for this research is the interest and passion that the researcher has for the topic. As a result of completing this research, the researcher was invited to, and has already been involved in discussions regarding the design and implementation of a system for electronically recording clinical pharmacy services. As previously mentioned, digitisation of clinical pharmacy services is both inevitable and imminent and the researcher believes that this research has provided and will provide further, valuable insights on how best such a system could be implemented in the future.

## 7.6 Conclusion

The objectives of the research were to understand what are the main benefits and challenges for digitising clinical service records in community pharmacy. The research has demonstrated that moving from a paper-based consultation recording system to an electronic system has many potential benefits. These include increased efficiencies and productivity for users, timely patient insights and rich datasets for research, improvement in the quality and accuracy of data collected and most importantly an improvement in quality of care and patient safety. To successfully implement electronic records in community pharmacy for clinical services, challenges such as resistance to change, lack of interoperability and integration, loss of productivity and changes to workflow and cost must be appropriately addressed.

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**Appendix A Winter Flu Vaccination Consultation Record**

 **Winter flu vaccination record form**

To be retained by the Pharmacy and filed securely

Pharmacy Stamp

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**1. Patient information**

First name:  Surname:

Address:

Age:  Date of birth:  DD / MM / YYYY Gender: Male  Female

PPS no. (if available):  Phone number:

Doctor's name, address and contact details (if any):

Pharmacists are requested to inform your Doctor when you receive a winter flu vaccine.  
I give permission for Boots to share the information on this page with my Doctor. Yes  No

---

**2. Pharmacy information**

**Details of influenza vaccine administered to patient**

PCRS vaccine entry: Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	<b>Affix dispensing label here</b>
Is the patient eligible to receive the vaccine? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Vaccination site: Right arm <input type="checkbox"/> Left arm <input type="checkbox"/>	
Pharmacist signature: <input type="text"/>	
PSI Registration no.: <input type="text"/>	
Date of administration: <input type="text"/> / <input type="text"/> / <input type="text"/> Time: <input type="text"/>	<b>Apply manufacture vaccine label here, as applicable</b>
Date sent to Doctor: <input type="text"/> / <input type="text"/> / <input type="text"/> by Post <input type="checkbox"/> Fax <input type="checkbox"/>	
Date data input in PCRS/sent to HSE: <input type="text"/> / <input type="text"/> / <input type="text"/>	

### 3. Risk groups recommended to receive the Winter Flu Vaccine

Are you in an at-risk group recommended to receive the flu vaccine?  Yes  No

If yes, which at-risk group? (select one or more of the following):

Aged 65 and over	<input type="checkbox"/>	Residents of nursing homes and other long stay institutions	<input type="checkbox"/>
Are pregnant (vaccine can be given at any stage of pregnancy)	<input type="checkbox"/>	Are a carer (the main carers of those in the at-risk groups)	<input type="checkbox"/>
Are a healthcare worker	<input type="checkbox"/>	Have regular contact with pigs, poultry or water fowl	<input type="checkbox"/>

Have a long-term health condition such as:

Chronic liver disease	<input type="checkbox"/>	Chronic renal failure	<input type="checkbox"/>
Diabetes mellitus	<input type="checkbox"/>	Down's syndrome	<input type="checkbox"/>
Haemoglobinopathies	<input type="checkbox"/>	Morbid obesity i.e. body mass index over 40	<input type="checkbox"/>
Chronic respiratory disease, including chronic obstructive pulmonary disease (COPD), cystic fibrosis, moderate or severe asthma or bronchopulmonary dysplasia	<input type="checkbox"/>		
Chronic neurological disease including multiple sclerosis, hereditary and degenerative disorders of the central nervous system	<input type="checkbox"/>		
Immunosuppression due to disease or treatment (these include anyone on treatment for cancer)	<input type="checkbox"/>		
Other (please specify)	<input type="text"/>		

Do you have a Medical card/Doctor visit card/HAA/2015A card?  Yes  No

If yes, please state the number

### 4. Checking eligibility to avail of the service

- Are you aged 18 years or over?  Yes  No
- Do you feel unwell, have a temperature or an infection?  Yes  No
- Are you allergic to eggs?  Yes  No
- Have you ever had an allergic reaction to any previous influenza vaccine?  Yes  No

#### Pharmacist consultation

- Do you suffer from any bleeding disorder or are you taking anticoagulant medication such as Warfarin?  Yes  No
- Do you have any known allergies (including any component or excipient of vaccine)?  Yes  No  
If yes, please specify
- Have you had the flu vaccine before?  Yes  No  
If no, do you have a condition or take medicines that might affect your immune system?  Yes  No

#### Additional information

- I give permission for the information gathered during the service to be used to help Boots improve the service. I understand this means Boots may use and share anonymous information from this service with carefully selected third parties, strictly for medical analysis and research.  Yes  No
- In order to make sure Boots is meeting the needs of patients, Boots may contact some patients for feedback. I am happy to be contacted in this way.  Yes  No

### 5. Patient consent

I confirm I have read and understood the contents of the Boots Winter Flu Vaccination Service leaflet and confirm the information I have provided is correct to the best of my knowledge. I understand that the Boots Winter Flu Vaccination Service will only be offered if the Pharmacist believes the vaccine is appropriate for me. I am happy to proceed. If I am paying, I understand that certain groups are entitled to a free vaccine from their Doctor/Pharmacist. I am aware that Boots will retain this Vaccination Record Form in a manner consistent with Data Protection requirements for a period of eight years. I give permission for a copy of my patient information and winter flu vaccination administration record to be provided to the HSE.\* I agree to allow Boots to use the personal information I have provided for this service to support any other Boots services I may use, which may include a reminder to book future appointments. I am aware that I can obtain further information about Boots privacy policy on its website.\*

Patient signature:  Date:

I verify that I have received an injection of influenza vaccine

\*Personal data collected by the HSE PCRS is used for the purpose of providing a health service. It is required, stored, processed and disclosed to other bodies in accordance with the laws relating to proper treatment of personal data.

<http://www.boots.ie/en/help/Privacy-Cookies/>

## **Appendix B Informed Consent Form**

### **TRINITY COLLEGE DUBLIN INFORMED CONSENT FORM**

**LEAD RESEARCHER:** Michelle Doyle

**RESEARCH STUDY:** Digitising clinical service records in community pharmacy

#### **BACKGROUND OF RESEARCH:**

This research aims to investigate the potential benefits of digitising clinical service records in community pharmacy. The research will also seek to understand the challenges of digitising clinical service records.

#### **PROCEDURES OF THIS STUDY:**

This study will involve a comprehensive literature review to establish the prevalence of digital clinical service records and their use currently within the community pharmacy sector. The researcher will illustrate the type of data that is currently captured on paper-based consultation records within the community pharmacy. This will endeavour to demonstrate the wealth of data that is currently 'locked' into community pharmacy.

The researcher will analyse electronic recording systems that are used currently within the pharmacy sector to investigate their functionality, usability and potential benefits. This evaluation will provide insights for the future design and development of an electronic recording system for clinical pharmacy service consultations within community pharmacy.

Semi-structured interviews of approximately 30-40 minutes will be conducted to gain insight into the views of participants on digitising clinical service records in community pharmacy. Participation in this research will be completely voluntary and participants may refuse to answer any question and may withdraw at any time without penalty. Participation will be anonymous and no personal details will be recorded. With permission from the participants the interviews will be recorded, field notes will also be made and then transcribed to text accordingly. The audio recordings will be deleted once transcribed. Only the researcher and research supervisor will have access to the data. In accordance to the Data Protection Act, the data will be stored and processed on a password protected PC. It will be retained for a period of 5 years then destroyed. All participants will be given a participant information sheet which will ensure the participants in the research are fully informed.

The researcher will recruit the intended participants through personal contacts. The potential participants will be contacted via email and if participants agree to participate, then an email will be sent with the information sheet attached to allow the participant to read in advance. These will also be available to the participant on the day of the interview also. One participant is a work colleague but is neither the researcher's employee nor employer. No conflicts of interests have been found

with any of the participants and in the unlikely event that any illicit activities are made known, these will be reported to the appropriate authorities.

**PUBLICATION:**

The primary purpose of this research is to fulfil the research dissertation requirements for the MSc in Health Informatics, Trinity College Dublin. Semi-structured interviews will be completely anonymised.

**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 understand that I may stop electronic recordings at any time, and that I may at any time, even subsequent to my participation have such recordings destroyed (except in situations such as above).
- I understand that, subject to the constraints above, no recordings will be replayed in any public forum or made available to any audience other than the current researchers/research team.
- 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'S CONTACT DETAILS:**

Michelle Doyle

email: [doylem39@tcd.ie](mailto:doylem39@tcd.ie)

Telephone: 087 - 6476335

**INVESTIGATOR'S SIGNATURE:**

**DATE:**

## **Appendix C INFORMATION SHEET FOR PROSPECTIVE PARTICIPANTS**

### **TRINITY COLLEGE DUBLIN INFORMATION SHEET FOR PROSPECTIVE PARTICIPANTS**

**Lead Researcher:** Michelle Doyle

**Research Study:** Digitising clinical service records in community pharmacy

#### **Background**

I would like to invite you to participate in this research, which is being undertaken as part of the requirements for an MSc in Health Informatics at Trinity College Dublin. Participation in this research is completely voluntary and participants may refuse to answer any question and may withdraw at any time without penalty. Participation is fully anonymous and no personal details will be recorded. Please take some time to read this information sheet and ask any questions that you may wish.

#### **What is this research about?**

This research aims to investigate the potential benefits of digitising clinical service records in community pharmacy. The research will also seek to understand the challenges of digitising clinical service records.

#### **PROCEDURES OF THIS STUDY:**

This research will involve a comprehensive literature review to establish the prevalence of digital clinical service records and their use currently within the community pharmacy sector. The researcher will illustrate the type of data that is currently captured on paper-based consultation records within the community pharmacy. This will endeavour to demonstrate the wealth of data that is currently 'locked' into community pharmacy.

The researcher will analyse electronic recording systems that are used currently within the pharmacy sector to investigate their functionality, usability and potential benefits. This evaluation will provide insights for the future design and development of an electronic recording system for clinical pharmacy service consultations within community pharmacy.

#### **Why was I chosen to take part?**

A number of participants were chosen based on their background and interests in the research topic.

#### **What is involved?**

If you chose to participate, you will be invited to take part in a semi-structured interview that will last approximately 30 – 40 minutes in a location that is convenient to you. With permission, the interview will be recorded, field notes will also be made and then transcribed to text accordingly. The audio recordings will be deleted once transcribed.

**Is the research confidential?**

Only the researcher and research supervisor will have access to the data. In accordance to the Data Protection Act, the data will be stored and processed on a password protected PC. The data will be retained for a period of 5 years then destroyed.

**Where can I get further information?**

If you need any further information now or at any time in the future, please contact:  
Michelle Doyle, 0876476335.

## Appendix D Research Ethics Application and Approval

<b>School of Computer Science &amp; Statistics</b> <b>Research Ethics Application</b>	
<b>Part A</b>	
Project Title: Digitising clinical service record forms in community pharmacy	
Name of Lead Researcher (student in case of project work): Michelle Doyle	
Name of Supervisor: Prof. Lucy Hederman	
TCD E-mail: <a href="mailto:doylem39@tcd.ie">doylem39@tcd.ie</a>	Contact Tel No.: 087 - 6476335
Course Name and Code (if applicable): MSc Health Informatics	
Estimated start date of survey/research: April 2017	
I confirm that I will (where relevant):	
<ul style="list-style-type: none"><li>• Familiarize myself with the Data Protection Act and the College Good Research Practice guidelines <a href="http://www.tcd.ie/info_compliance/dp/legislation.php">http://www.tcd.ie/info_compliance/dp/legislation.php</a>;</li><li>• Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)</li><li>• Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)</li><li>• Obtain informed consent for participation (a copy of the informed consent form must be included with this application)</li><li>• Should the research be observational, ask participants for their consent to be observed</li><li>• Tell participants that their participation is voluntary</li><li>• Tell participants that they may withdraw at any time and for any reason without penalty</li><li>• Give participants the option of omitting questions they do not wish to answer if a questionnaire is used</li><li>• Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs</li><li>• On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)</li><li>• Verify that participants are 18 years or older and competent to supply consent.</li><li>• If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk</li><li>• Declare any potential conflict of interest to participants.</li><li>• Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.</li><li>• Act in accordance with the information provided (i.e. if I tell participants I will not do something, then I will not do it).</li></ul>	
Signed: <u>Michelle Doyle</u> Lead Researcher/student in case of project work	Date: 6 <sup>th</sup> March 2017

**Part B**

<i>Please answer the following questions.</i>		<i>Yes/No</i>
Has this research application or any application of a similar nature connected to this research project been refused ethical approval by another review committee of the College (or at the institutions of any collaborators)?		<b>No</b>
Will your project involve photographing participants or electronic audio or video recordings?		<b>Yes</b>
Will your project deliberately involve misleading participants in any way?		<b>No</b>
Does this study contain commercially sensitive material?		<b>No</b>
Is there a risk of participants experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any such problems (e.g. who they can contact for help).		<b>No</b>
Does your study involve any of the following?	Children (under 18 years of age)	<b>No</b>
	People with intellectual or communication difficulties	<b>No</b>
	Patients	<b>No</b>

**School of Computer Science and Statistics  
Research Ethical Application Form**

Details of the Research Project Proposal must be submitted as a separate document to include the following information:

1. Title of project
2. Purpose of project including academic rationale
3. Brief description of methods and measurements to be used
4. Participants - recruitment methods, number, age, gender, exclusion/inclusion criteria, including statistical justification for numbers of participants
5. Debriefing arrangements
6. A clear concise statement of the ethical considerations raised by the project and how you intend to deal with them
7. Cite any relevant legislation relevant to the project with the method of compliance e.g. Data Protection Act etc.

**Part C**

I confirm that the materials I have submitted provided a complete and accurate account of the research I propose to conduct in this context, including my assessment of the ethical ramifications.

Signed: Micelle Doyle Date: 20/3/2017  
Lead Researcher/student in case of project work

*There is an obligation on the lead researcher to bring to the attention of the SCSS Research Ethics Committee any issues with ethical implications not clearly covered above.*

**Part D**

If external or other TCD Ethics Committee approval has been received, please complete below.

External/TCD ethical approval has been received and no further ethical approval is required from the School's Research Ethical Committee. I have attached a copy of the external ethical approval for the School's Research Unit.

Signed: ..... Date: .....  
Lead Researcher/student in case of project work

**Part E**

If the research is proposed by an undergraduate or postgraduate student, please have the below section completed.

I confirm, as an academic supervisor of this proposed research that the documents at hand are complete (i.e. each item on the submission checklist is accounted for) and are in a form that is suitable for review by the SCSS Research Ethics Committ

Signed: Lucy Hederman Date: 20/03/17  
Supervisor

rec-app-help@tchpc.tcd.ie

to me ▾

The status of 'Digitising clinical service record forms in community pharmacy' has been updated by the Committee.

Title: 'Digitising clinical service record forms in community pharmacy'

Applicant Name: Michelle Doyle

Submitted by: Michelle Doyle

Academic Supervisor: Lucy Hederman

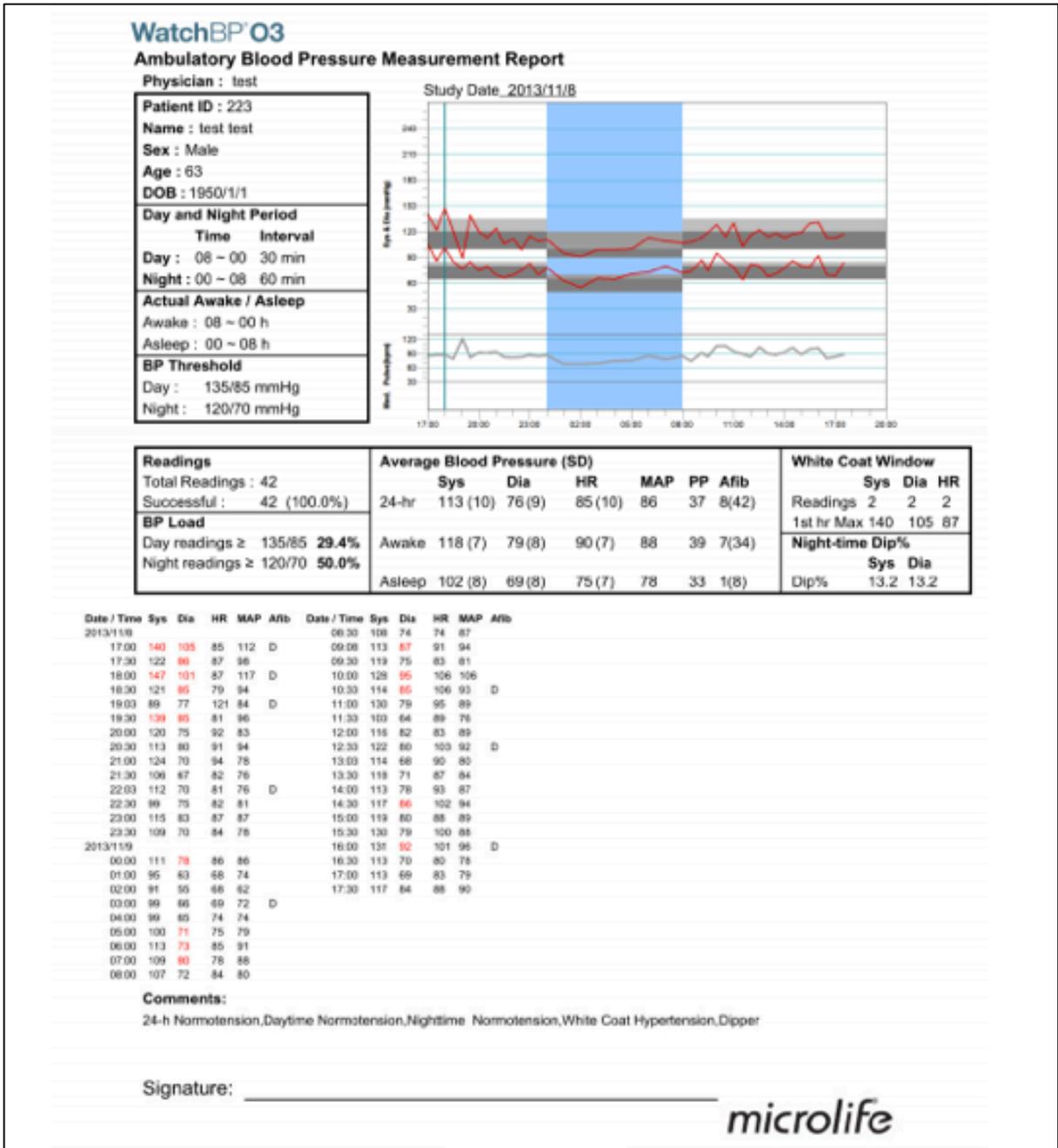
Application Number: 20170313

Result of the **REC** Meeting: Approved

The Feedback from the Committee is as follows:

All issues have been addressed. This research may proceed.

## Appendix E Microlife Watch BP 03 AFib device Ambulatory Blood Pressure Measurement Report



## Appendix F Ambulatory Blood Pressure Monitoring Consultation Record Form

<b>Patient Record Form</b>	 5 045096 128912 >	
To be retained by the store and filed securely		
<b>Part 1: Patient information</b>		
First name:	<input type="text"/>	
Surname:	<input type="text"/>	
Address:	<input type="text"/>	
	<input type="text"/>	
Email:	<input type="text"/>	
Phone no:	<input type="text"/>	
Date of birth:	<input type="text"/>	
Doctor's name:	<input type="text"/>	
Contact details:	<input type="text"/>	
Male: <input type="checkbox"/> Female: <input type="checkbox"/>	Are you pregnant? Yes <input type="checkbox"/> No <input type="checkbox"/>	
Ethnic origin: White <input type="checkbox"/> Asian (India, Pakistan, Bangladesh or Sri Lanka) <input type="checkbox"/> Other Asian <input type="checkbox"/>		
Black African <input type="checkbox"/> Black Caribbean <input type="checkbox"/> Other Black <input type="checkbox"/> Mixed <input type="checkbox"/>		
Other (please specify)	<input type="text"/>	
I am happy to be contacted by phone: Yes <input type="checkbox"/> No <input type="checkbox"/>		
I give permission for the results of my blood pressure monitoring and any recommendations to be provided to my Doctor: Yes <input type="checkbox"/> No <input type="checkbox"/>		
<b>Please answer the following questions</b>		
Are you aged 18 years or over? (You must be aged 18 or over to use this service) Yes <input type="checkbox"/> No <input type="checkbox"/>		
Have you had a 24-hour blood pressure measurement taken before? Yes <input type="checkbox"/> No <input type="checkbox"/>		
If yes, please detail:	<input type="text"/>	
Do you have any of the following? (Please tick one or more as relevant)		
Medical Card <input type="checkbox"/>	Doctor Visit Card <input type="checkbox"/>	Health Amendment Card <input type="checkbox"/>
Long Term Illness book <input type="checkbox"/>	Private Health Insurance <input type="checkbox"/>	
<b>Part 2: Patient information</b>		
Do you smoke, or have you ever smoked? Yes <input type="checkbox"/> No <input type="checkbox"/>		
If yes, how many cigarettes each day? <input type="text"/>		
How long have you been a smoker (no. of years)? <input type="text"/>		
Do you currently smoke? Yes <input type="checkbox"/> No <input type="checkbox"/>		
How much alcohol on average do you drink per week:		
<small>(One standard drink is approximately equal to half a pint of normal beer/lager/bider OR one small glass of wine OR one single measure of spirits)</small>		
Number of standard drinks per week <input type="text"/>	Don't drink <input type="checkbox"/>	
Do you take any medication? Yes <input type="checkbox"/> No <input type="checkbox"/>	If yes please detail:	
	<input type="text"/>	
Do you have diabetes? Yes <input type="checkbox"/> No <input type="checkbox"/>		
If yes, please select which type: Type 1 <input type="checkbox"/> or Type 2 <input type="checkbox"/>		

## Part 2: Patient information continued

Do you have high cholesterol? Yes  No  Unsure

Have you ever had any of the following: (Please tick one or more as relevant)

Ischaemic Stroke  TIA-Trans Ischaemic Attack (mini stroke)

Haemorrhagic Stroke  Heart Attack  Unsure

Have you ever been diagnosed with any of the following: (Please tick one or more as relevant)

Atrial Fibrillation  Heart Failure

Vascular disease (condition that affects your circulatory system)  Unsure

## Part 3: Patient consent

I confirm that the information I have provided is correct to the best of my knowledge and I understand the information provided to me about the service. I am happy to proceed with having the monitoring device fitted and agree to return the device to the Pharmacy after 24 hours. I understand that my blood pressure results will be provided to me by my Pharmacist when I return to the Pharmacy, and that the Pharmacist may refer me to my Doctor. I am aware that Boots will retain the results from my 24-hour Blood Pressure Monitoring report, along with this Consultation Record Form, in a manner consistent with Data Protection requirements, for a period of 8 years.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

The information gathered during the service may be used to help Boots improve the service. I understand that this means Boots may use and share anonymous information from this service with carefully selected third parties, for medical analysis and research.

If you do not wish for your anonymous information to be shared in this way tick here

In order to assess the benefits of this service, Boots may contact some patients in the future for follow up (e.g. in 6 to 12 months).

I am happy to be contacted for this purpose: Yes  No

In order to make sure Boots is meeting the needs of patients, Boots may contact some patients for feedback. I am happy to be contacted for this purpose: Yes  No

### For Pharmacy use only

#### Part 1:

ABPM device connected by: \_\_\_\_\_

Signature: \_\_\_\_\_

Patient reference: \_\_\_\_\_

Battery change complete: Yes  No  Monitor ID: \_\_\_\_\_

Night-time hours: \_\_\_\_\_ pm \_\_\_\_\_ am Daytime recording interval: \_\_\_\_\_ mins

Night-time recording interval: \_\_\_\_\_ mins

#### Part 2:

Height: \_\_\_\_\_ m Weight: \_\_\_\_\_ Kg BMI: \_\_\_\_\_ Kg/m<sup>2</sup>

Arm circumference: \_\_\_\_\_ cm BP reading right arm: \_\_\_\_\_ mmHg

BP reading left arm: \_\_\_\_\_ mmHg Date fitted: D D / M M / Y Y Y Y

Right arm: \_\_\_\_\_ Left arm: \_\_\_\_\_ Time on: \_\_\_\_\_

Requested by: \_\_\_\_\_

#### Results consultation

Date returned and results consultation: \_\_\_\_\_

Pharmacist name: \_\_\_\_\_

Signature: \_\_\_\_\_

# Appendix G Pharmacy Strep A Testing Consultation Record Form



## Sore Throat Test and Treat Service – Consultation Record Form

16/11/2015 14:16

### 1. Pre-screening Consultation

**To be completed by an authorised Pharmacist or Healthcare team member**

Team member name: \_\_\_\_\_ Time: \_\_\_\_\_

Patient's reason for choosing the service:  
 Self-referral  Referred by Doctor   
 Referred by friend/family  Pharmacy team recommendation

Gender:  Male  Female

**1.1 Eligibility Criteria**  
If the patient answers YES to any of the following, then they are not suitable for the service – refer to Pharmacist.

Has the patient had symptoms for 10 days or more? Yes  No   
 Has the patient had symptoms for less than 3 days? Yes  No   
 Is the patient under 16 years old? Yes  No  note age  
 Has the patient already taken antibiotics for their sore throat? Yes  No   
 Are the patient's symptoms improving? Yes  No

Note any symptoms or additional information in the space below:  
 \_\_\_\_\_  
 \_\_\_\_\_

**1.2 Centor – Part 1**

- What is the patient's temperature: \_\_\_\_\_ °C  
 If the patient's temperature is <38°C, have they recorded a temperature >38°C during this illness? Yes  No
- Patient recorded temperature: \_\_\_\_\_ °C
- Date patient recorded this temperature: DDMMYYYY
- Does the patient have a current or history of a fever of 38°C or more? Yes  No  (score 1 if Yes)
- Is a cough absent? Yes  No  (score 1 if Yes)

**Centor score (part 1) = /2**

If Centor score is 1 or 2 proceed to Section 2: Pharmacist consultation  
 If Centor score is 0, refer to Pharmacist as required, complete Section 3 Consultation Outcome

Pre-screening consultation only  
  
 5 045096 512087 >

### 2. Pharmacist Consultation

**To be completed by authorised Pharmacist ONLY**

Pharmacist name: \_\_\_\_\_  
 PS number: \_\_\_\_\_

**2.1 Exclusion Criteria**  
Check if patient is excluded from the service – refer to Doctor as required

**Check if the patient:**  
 Has any visible signs or symptoms of any other infection or serious illness? Yes  No   
 Is not exhibiting any red flag symptoms requiring referral Yes  No   
 Red flag symptoms that may indicate referral include:  
 Presence of skin rash, dysphagia (difficulty swallowing), drooling, noisy breathing, difficulty breathing, stridor (a loud, harsh, high-pitched respiratory sound) muffled voice, severe pain and/or other severe symptoms, symptoms that worsen very quickly

**If patient not excluded complete Centor Part 2 below  
 If excluded go to Consultation Outcome Section below**

**2.2 Centor – Part 2**

**Complete physical examination**

Are the patient's lymph nodes tender? Yes  No  (score 1 if Yes)  
 Does the patient have any exudates on the tonsils? (if unilateral symptoms, refer to Doctor as required) Yes  No  (score 1 if Yes)

**Total Centor score: /4 (results of Part 1 & Part 2)**  
**If total score is 3 or 4 perform Throat Swab Test  
 If total score is 1 or 2 complete Consultation Outcome section below**

**2.3 Throat Swab Test**

Lot number of swab test: \_\_\_\_\_ Expiry date: DDMMYYYY  
 Date and time swab test completed: \_\_\_\_\_

Test result outcome: +ve  -ve

**Provide post consultation leaflet, consultation summary and Doctor letter form and self-care advice as relevant**

**3. Consultation Outcome**

Self-management advice given: Yes  No   
 OTC products recommended? Yes  No   
 Referred to Doctor? Yes  No   
 Reason: \_\_\_\_\_

### Patient Information

First Name: \_\_\_\_\_  
 Surname: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Date of birth DDMMYYYY: \_\_\_\_\_

Contact number (preferably mobile): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Email: \_\_\_\_\_

Are you currently taking any medication or diagnosed with a medical condition? Yes  No   
 If yes, please detail \_\_\_\_\_  
 \_\_\_\_\_

**Patient Consent**

I confirm that I have read and understood the contents of the Boots Sore Throat Test and Treat leaflet and that the information I provide is correct to the best of my knowledge. I am happy to proceed with the Sore Throat Test and Treat Service and understand this involves allowing the Pharmacist to undertake a physical examination of my throat as well as a throat swab where necessary. I understand that the throat swab will only be offered if the Pharmacist believes it's appropriate for me and that I may be referred to my Doctor for follow-up care. I'm aware that Boots will retain this consultation record form in a manner consistent with Data Protection Requirements for a period of 2 years.

Signature: \_\_\_\_\_  
 Date: \_\_\_\_\_

Pharmacist consultation  
  
 5 045096 512094 >

1000202450/N/A/06.12.15-20.12.15

FL35345\_1000202450 BTS SoreThroatTest CRF\_287x210.v1.indd 1