

Supporting and enabling early career pharmacy professionals in delivering data driven care: A guidance document for the profession

Document Title: Supporting early career pharmacy professionals in data driven care: A guidance document for the profession

Version number: 1

First published: October 2018

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Classification: OFFICIAL

Contents

Foreword.....	5
1 Executive summary	6
Background.....	7
1.1 From Healthcare Informatics to Clinical Informatics and Data Driven Care	7
1.2 Data Driven Care	8
1.3 The benefits of data driven care for medicines and pharmacy.....	9
1.4 Short life working group	11
2 Early Career Pharmacy professionals' experiences in using data to drive improvements	12
2.1 The need for learning opportunities.....	13
2.2 The need for a cultural change.....	13
2.3 The need for better accessibility and availability of data	14
2.4 Key Priorities.....	15
3 Domain 1 - Regulation.....	15
3.1 Current Position	15
3.2 International Practice	16
3.3 Other Healthcare Professional Standards	17
3.4 Summary	17
3.5 Key Priorities.....	17
4 Domain 2 – Education	18
4.1 Current situation from undergraduate universities	18
4.2 Current postgraduate opportunities.....	20
4.3 How senior pharmacy professionals can support early career staff.....	20
4.4 Key Priorities.....	21
5 Domain 3 – Professional Development.....	21
5.1 Key Priorities.....	24
6 Domain 4 – Network and Peer Support	24
6.1 Current Position	25
6.2 Network Options	25
6.3 Key Priorities.....	26
7 Recommendations	26
7.1 Overarching principles and key recommendations	27
7.1.1 Chief Pharmaceutical Officer's Senior Leadership Team	27
7.1.2 The Regulator	27
7.1.3 Professional and Educational bodies	28
7.1.4 Academia.....	28
7.1.5 Employers.....	28
7.1.6 Early career pharmacy professionals	29
8 Next steps	29
9 Appendices	30
10 References.....	31

Foreword

The practice of pharmacy in the UK has historically been based around three areas:

People – with patients at the centre and including the personal interaction with pharmacy staff (Pharmacists, Pharmacy Technicians and support staff).

Clinical – understanding of the safe and effective use of medicines.

Supply – of medicines safely and cost effectively.

In order to truly optimise the use of medicines an additional dimension is required – Data! This requires a culture change in how pharmacy professionals view their roles and skills for understanding the science of clinical informatics. It is not just volumes of medicines, costs or Key Performance Indicators as to speed or safety of supply but true Medicines Optimisation which requires structured data systems to allow the capture, analysis and clinical use of patient level informatics. This will enable the connection of:

- Prescribing information – diagnosis and indication for a medicine;
- Product and supply information;
- Outcomes from the use of the medicine in terms of patient benefit and health gain;
- Patient factors including concordance and any potential harms;
- Costs, clinical choice and efficiency of supplied medicines.

This reset of the professional view on the use of data will require multiple small changes in how strategies, policies, formative education, training and approaches to patient care with medicines are considered across the healthcare system in England if the profession is to stay ahead of the game. This will take leadership at all levels and will support the digital transformation agenda in health and social care.

With over 1 billion prescriptions supplied in primary care annually and a smaller volume but, often more complex range of higher cost and risk medicines supplied in secondary care, pharmacy teams need to understand the science of informatics and why data structures, standards and systems are important to their practice and patients care. This requirement will become further emphasised as healthcare moves into the new world of genomics and personalised medicines.

I would thank the members of the Short Life Working Group and, in particular the Chief Pharmaceutical Officers Clinical Fellows (2017-2018) who have led on developing the sections of this report.

Andrew Davies
Chairman – Short Life Working Group

Professional Lead for Hospital Pharmacy
NHS Improvement
August 2018



1 Executive summary

The amount of data that is used and collected by and for the NHS is increasing each year. This provides a huge opportunity for health and social care teams to improve patient care and safety. Pharmacy professionals are well placed to drive these advancements with the digitalisation of many processes within current practice. The development of datasets and dashboards such as *The Model Hospital* and *Fingertips* has helped provide the basis for obtaining improvements in patient care and outcomes. There have been notable successes where pharmacy professionals have used data to drive improvements within the NHS including reducing antimicrobial prescribing in primary care and reducing numbers of strokes by anticoagulating patients with atrial fibrillation. Early career pharmacy professionals have also contributed to local successes such as the development and implementation of a clinical pharmacy dashboard to reduce missed doses and increase patient facing clinical care based on prioritisation.

In order to build on these successes, it is vital for the current and future pharmacy workforce to be skilled in the use of data to improve patient outcomes. To support this, Dr Keith Ridge, the Chief Pharmaceutical Officer for England, commissioned a review to develop understanding of and advise on the engagement of early career pharmacy professionals in using data to improve patient outcomes. A Short Life Working Group (SLWG) was established and identified four priority domains which specific task and finish groups would explore: Regulation, Education, Network and Peer Support and Professional Development.

The SLWG met four times between March and June 2018, and recommended three overarching principles that are considered fundamental to embedding data driven care into everyday practice:

- Enhanced **learning opportunities** should provide a foundation for pharmacy professionals to move from a state of 'data denial' or 'data indifferent' to 'data informed' and 'data driven' and to maintain the skills they acquire.
- A **culture** where data driven care is part of the role of all pharmacy professionals at all career stages should be established.
- **Available and easily accessible data** will increase engagement and empower early career pharmacy professionals.

To optimise the best use of data to improve patient outcomes everyone needs to take action. The collaboration and support of the Chief Pharmaceutical Officer's Senior Leadership Team, the regulator, professional and educational bodies, academia, employers and early career pharmacy professionals themselves will help drive the recommendations within this report and provide early career pharmacy professionals with the necessary skillset and knowledge to optimise the use of data to improve patient outcomes.

Background

Data within the NHS is a critical component of modern healthcare, with the global totality of known medical information estimated to be doubling every two years. The breadth and depth of data collected in the NHS is unparalleled globally and presents a huge opportunity for improved patient care, research and future innovation. Widespread digitisation in healthcare means that data from patient records, pathology, imaging and digital diagnostic and monitoring tools can be used to support and inform the management of disease. This has led to national and some local healthcare organisations moving towards greater data driven practice, treating data as a strategic asset, putting in place processes and systems that support clinical decision-making and distribute resources where it is needed most.

National strategic publications including the NHS Five Year Forward View¹ and the Life Sciences Industrial Strategy² highlight the potential for data to transform health and care within the NHS. To maximise the opportunity and use data effectively to improve patient outcomes it is vital for the health and care workforce to be skilled in the use of data and clinical informatics in parallel to clinical practice. In 2018 the then Secretary of State for Health, the Right Honourable Jeremy Hunt MP, asked the clinician and Director of the Scripps Translational Science Institute in the United States - Dr Eric Topol, to explore the implications of the advancement in digital technology on the health and care workforce. This work is ongoing but the interim report has identified the importance of clinical informatics and data³.

There are currently a range of learning and development opportunities available to healthcare workers but they are mainly focussed at those that already specialise in digital roles such as the NHS Digital Academy⁴ or those that are looking to improve basic digital skills (HEE Building a Digital Ready Workforce⁵). The amount of data available to pharmacy professionals has increased significantly over the past few years – the skills to use these data effectively have not developed as quickly.

1.1 From Healthcare Informatics to Clinical Informatics and Data Driven Care

Within the UK and globally in relation to healthcare provision, clinical benefit and efficiency, there is a growing interest in the all-encompassing subject of **Healthcare Informatics**. The Department of Health identified a definition for this subject as being *'The knowledge, skills and tools that enable information to be collected, managed, used and shared to support the delivery of healthcare and to promote health and wellbeing'*⁶

Healthcare informatics is a multidisciplinary field involving information engineering applied to healthcare. Patient based clinical information is managed using health information technology (HIT) to improve outcomes from clinical treatment. Whilst, in its broadest definition, healthcare informatics includes information science, computer science, social science, behavioural science, management science, and others and the US National Library of Medicine defines health informatics as "the interdisciplinary study of the design, development, adoption and application of IT-based innovations in healthcare services delivery, management and planning"

A sub-set of this overarching description is **'Clinical Informatics'** which can be described as the study of information technology and how it can be applied to the healthcare field⁷. It is a new and emerging speciality that is applicable to the majority of healthcare professions. Within this field there are a number of components that are relevant to pharmacy professionals across all healthcare settings. It is through clinical informatics that the concept of data driven care has evolved.

For the purpose of this review the focus is on Clinical Informatics (Figure 1) which is a subset that incorporates clinical disciplines including Pharmacy.

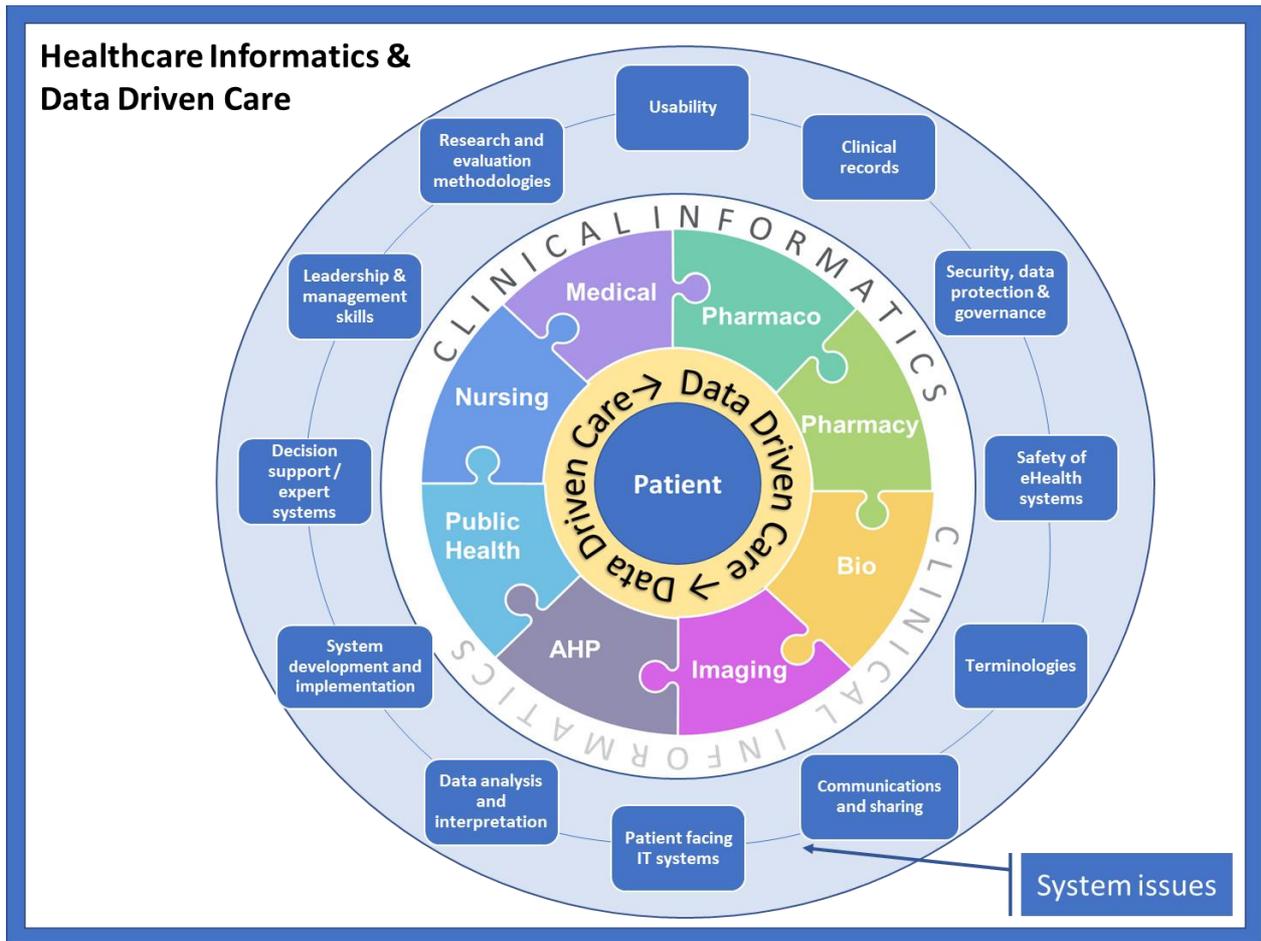


Figure 1 Healthcare Informatics, Clinical Informatics and Data Driven Care

1.2 Data Driven Care

'Data driven care' is a key component of Clinical Informatics and the term is used to describe the practical utilisation of data within practice, focussed on care with medicines to improve patient outcomes and safety.

Data Driven Care
The use of data within practice to improve patient outcomes and safety

There is an absolute need for a pharmacy workforce that is skilled in the interpretation of data to provide useful information that, through understanding and interpretation can be used to improve clinical outcomes and patient safety. For the pharmacy professions, the concept of data driven care is built on the thesis that we need to consider how pharmacy will move from holding a lake of medicines related data, to embedding this in our culture and using it to improve patient care.

It is important to differentiate data driven care from the use of information technology for example simply accessing a patient's summary care record would not be considered use of data in its self, rather as basic digital literacy. Data driven care would encompass the

interpretation and application of information within the summary care record to improve patient outcomes.

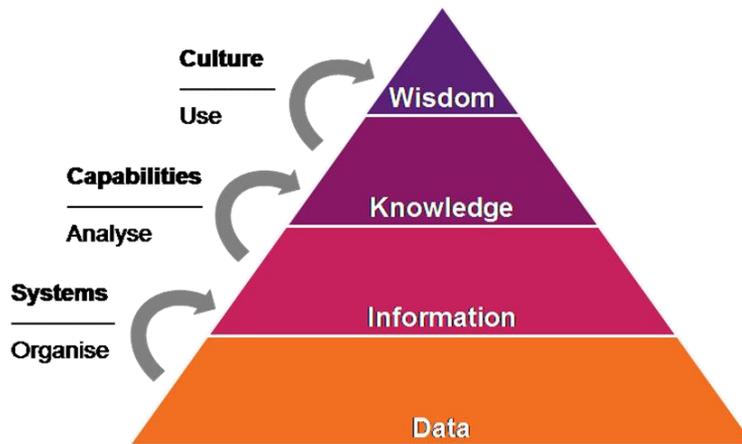


Figure 2 Translating data into wisdom

The importance of the Data, Information, Knowledge, Wisdom (DIKW) pyramid as shown in Figure 2 is a model that applies well in healthcare to use data to drive care.

Efficient and timely collation and analysis of data will also help address health inequalities that impact on particular groups - including the protected characteristics as defined in the Equality Act 2010. Data will help pharmacy professionals track if particular patient groups experience under or over prescribing or indeed barriers to accessing the correct medication for their needs.

1.3 The benefits of data driven care for medicines and pharmacy

Medicines are an important part of the NHS, representing the second largest spend in the NHS - £17.4 billion⁸ (second only to staff) and the most common intervention in patient care. It is known that up to 10% of hospital admissions are medicines related⁹ and 48% of adults take at least one prescribed medicine¹⁰. The NHS England Medicines Value Programme¹¹ was set up to respond to these challenges with the aim of obtaining the best possible outcomes for patients from their medicines whilst ensuring that it is also the best value for the taxpayer. The delivery of this is enabled by the wealth of medicines data available.

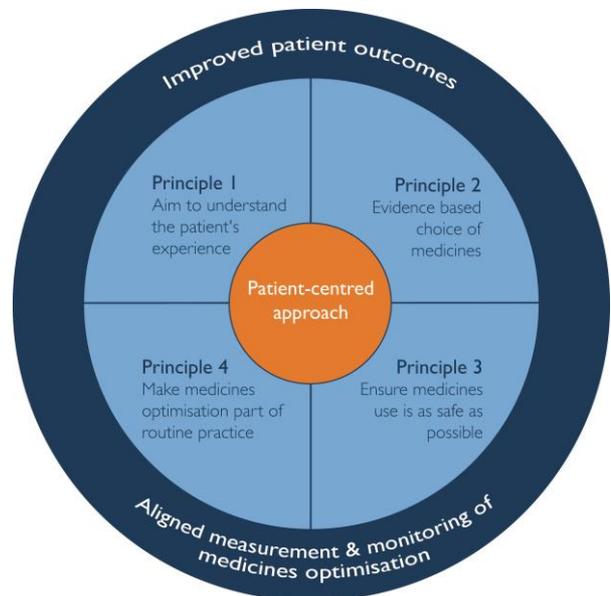


Figure 3 Medicines Optimisation framework

The NHS in England adopted the principles of Medicines Optimisation in 2013 with the establishment of a framework that includes the importance of improving patient outcomes as well as aligning measurement and monitoring of medicines optimisation¹². This framework (Figure 3) has been a foundation for the use of “medicines-related data” through the NHS Improvement *Hospital Pharmacy and Medicines Optimisation programme* and, in future years, the *Getting it Right First Time* programmes¹³ together with the NHS England *RightCare*¹⁴ programme are

fundamental to support this work and to provide a clearer picture of the effective use of medicines in the NHS. Pharmacy professionals are pivotal to the success of these programmes and it is important that we invest in greater development of early career professionals in the analysis, interpretation and presentation of data as well as the implementation of resultant changes to practice in order to make pharmacy professionals fit for now and the future.

Research commissioned by the former Secretary of State indicated that 22,000 people annually may be dying as a consequence of medication errors, with in excess of 60 million harmful medication errors per year¹⁵. Consequently the Secretary of State has established a medication safety programme being led by the NHS Patient Safety Director. As a result of this, a new linked data set, thought to be the first of its kind, has been established to directly link errors in prescribing with adverse outcomes in terms of admissions to hospital¹⁶. This creates a new opportunity for cross system working, by combining data sets from different organisations.

One of the biggest challenges facing us globally is the growing threat of antimicrobial resistance. This is one aspect of healthcare that relies heavily on data to inform the changes in resistance patterns and relevance of disease. Data in this area can also be used to drive improvements in prescribing practice and affect the impact of antimicrobial resistance. *Box 1 and 2* describe the use of data to change prescribing practice of antibiotics.

Box 1: CQUIN: Reducing the Impact of serious infections

Introduced in 2016/2017 across acute hospitals in England, AMR-CQUIN (Commissioning for Quality and Innovation) is a financially linked antibiotic prescribing quality improvement initiative. The aim was for >1% reductions in defined daily doses (DDDs)/1000 admissions of total antibiotics, piperacillin/tazobactam and carbapenems compared with 2013/2014 and improved review of empirical antibiotic prescriptions. Due to annual increases in antibiotic use, most Trusts needed to achieve >5% reductions in antibiotic consumption to attain the AMR-CQUIN goal of 1% reduction.

PHE host the data collected on the Fingertips database which is publically available data intended to raise awareness of antibiotic prescribing. Acute Trusts/ CCGs, GPs and laboratories can monitor their progress against national averages or other similar Trusts. A study published in the Journal of Antimicrobial Chemotherapy (J Islam et al. 2018) reviewed this intervention in 116/155 acute hospitals and found that AMR-CQUIN was associated with a reduction in antibiotic use. Nationally, the annual trend for increased antibiotic use reversed in 2016/2017.

Box 2: QP: Reducing Gram Negative Bloodstream Infections (GNBSIs) and inappropriate prescribing

The NHS England Quality Premium (QP) is intended to financially reward clinical commissioning groups (CCGs) for improvements in the quality of the services that they commission. During the 2 year period April 2015-March 2017 the QP has supported the UK AMR strategy by rewarding CCGs to reduce inappropriate antibiotic prescribing in primary care.

Dispensed prescription data is reported by the NHS Business Services Authority (NHSBSA) and was extracted at CCG level for each 12 month period and has been reported as: Year 1 (April 2015-March 2016); Year 2:(April 2016-March 2017); Year 1+2 (April 2015-March 2017)

Engagement with the QP scheme, which exceeded expected performance, was excellent with 96% of CCGs meeting or exceeding their individual 1% reduction target to reduce antibacterial items in Year 1. This delivered a 2.7million reduction in prescription items. Most CCGs reduced broad spectrum antibiotics prescribing in Year 1 and continued to do so in Year 2.

In Year 2 there was a 23% reduction of nearly 1 million broad spectrum antibiotic items.

The use of national incentive scheme that rewards CCGs to improve appropriate antibiotic use in primary care has been very effective, and consequentially has continued to be used to support implementation of the UK Antimicrobial Resistance Strategy.

There have been other notable successes where pharmacy professionals have used data to drive improvements within the NHS, such a reduction in expected number of strokes by identifying patients with atrial fibrillation and initiating anticoagulation¹⁷.

In order to build on these successes pharmacy professionals, need to understand how to use data to maximise patient outcomes and provide a basis for future working which will aid further integration with other healthcare professionals.

1.4 Short life working group

In March 2018 Dr Keith Ridge, the Chief Pharmaceutical Officer for England, commissioned a Short Life Working Group (SLWG) on Data Driven Care. The purpose of this group was to develop understanding of and advise on the engagement of early career pharmacy professionals in using data to improve patient outcomes.

The group identified four priority domains which specific task and finish groups would explore:

- Regulation
- Education
- Network and Peer Support
- Professional Development

The domains were explored through a number of pieces of work described below

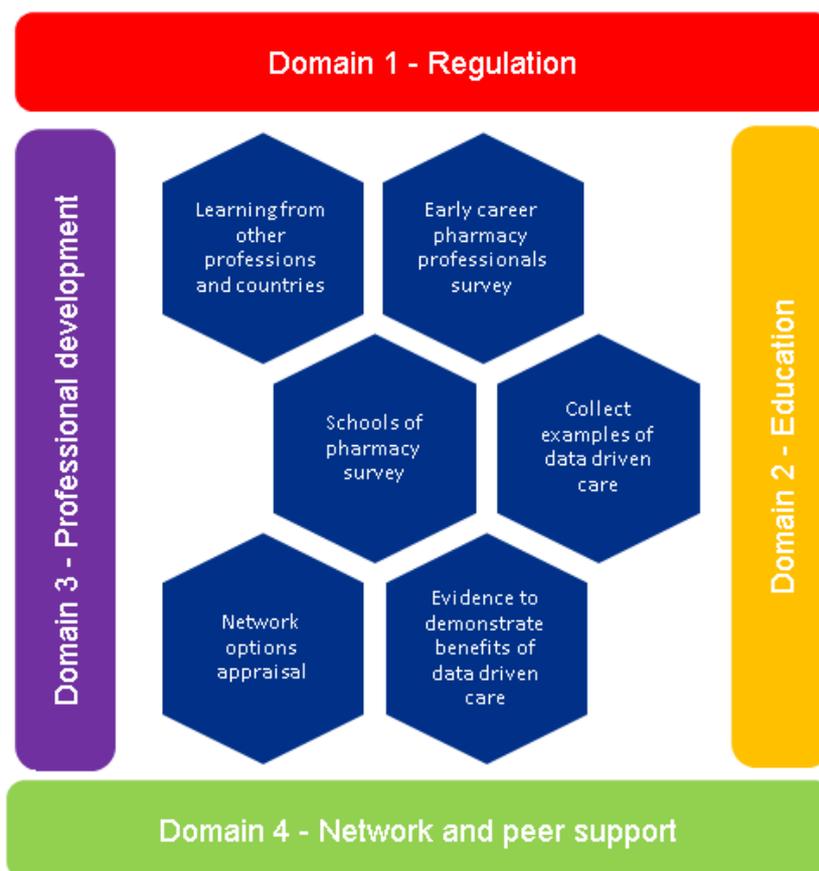


Figure 4 Work programme for SLWG

To support the deliberations of the SLWG two surveys were undertaken:

- a) One of early careers pharmacy professionals, aimed at understanding perceptions and experience of utilisation of data, education and training associated with data and the approach to sharing good practice and networking.
- b) The second survey was conducted amongst UK Schools of Pharmacy to understand the current provision of data education to undergraduates and the opportunities and barriers associated with this.

It is acknowledged that many elements of the identified priorities will also be relevant to pharmacy professionals later in their careers however this first phase of work intended to focus on those with less than 10 years in practice, who traditionally would be in posts that don't routinely use data, by increasing engagement and capability of this group.

2 Early Career Pharmacy professionals' experiences in using data to drive improvements

The SLWG wanted to understand the experiences of early careers pharmacy professionals to support the recommendations of the report. A survey (Appendix 1) was distributed primarily via email and social media across a variety of professional networks, over a period of four weeks from 18th April 2018 – 16th May 2018. The survey questions were developed following a literature search in this area and in consultation with the SLWG. Participation in the survey was voluntary and consent to use the captured data was gained via the survey. A total of 245 responses were received over a period of four

weeks; 195 pharmacists and 50 pharmacy technicians. Responses represent a diverse range of roles and clinical specialities.

The survey found that 92% of early careers pharmacy professional thought data was important in their current job roles but 34% were not routinely using it in practice.

Through the survey several barriers to the access and use of data were identified which broadly highlighted three key themes:

1. The need for **learning opportunities** associated with data driven care and specific systems and data platforms.
2. The need for a **cultural change** where data driven care is fundamental to the role of all pharmacy professionals at all stages of career.
3. The need for better **accessibly and availability of data**.

2.1 The need for learning opportunities

The survey found that early careers professionals felt they did not have the knowledge to interpret data, with 87% saying that had never received any formal training on data or clinical informatics. There needs to be an important focus on increasing understanding of data driven care and support the development of the necessary skills required to practice data driven care in future roles.

“Junior staff are not trained on this or aware of data sources and potential uses”

Early career pharmacy professional

It is also recognised there needs to be increased focus on the use of available data platforms e.g. ePACT2, Rx-Info Define, Public Health England FingerTips, OpenPrescribing.net, PrescQIPP, NHS England RightCare. Employers should ensure their staff are appropriately trained to use external data platforms to undertake their roles. Professional bodies and education providers have a role in developing resources and learning materials to support early careers professionals in using data and the various platforms available.

It was found that 20% of early career pharmacy professionals felt they were not encouraged to use data in their practice.

“Never been encouraged. It’s always been about collecting this data for others to analyse and make sense of. Never needed to analyse it myself.”

Early career pharmacy professional

Early careers professionals should be empowered to utilise data to make change in practice, not simply collect data for senior members of staff. All staff should also see the outputs of audits and data analysis, to realise the benefits for themselves and their roles

2.2 The need for a cultural change

The survey highlighted a sense that many pharmacists felt data driven care was not relevant to their role or that more responsibility sat with other members of the team.

“This is more done by the more senior pharmacists/practitioners – I don’t have much impact on changing clinical practice.”

“My role is mainly ensuring supply of medication and checking interactions. I am not required to change clinical practice”

Quotes from early career pharmacy professionals

This is clearly a cultural challenge across the profession, with senior staff needing to engage more junior members of the team and early career professionals understanding that they have an essential role and contribution in delivering data driven care.

The survey highlighted a perception that utilising data is not a patient facing activity and is undertaken at the expense of other activities.

“Time restrictions, utilising data stops me from interacting with patients

Early career pharmacy professional

The Carter report on operational productivity and performance in English NHS acute hospitals: Unwarranted variations¹⁸ describes medicines assurance, governance and audit programmes as clinical service activities which support medicines optimisation. Therefore, we must continue to drive this direction and ensure that use of data is given equal importance in daily tasks and is appropriately resourced to allow professionals to undertake this.

“...there isn't the time or manpower capacity to do much more than fire-fighting.”

Early career pharmacy professional

There is need for a cultural shift in the organisational approach to data use. The SLWG recognise data as a fundamental part to every pharmacy professional's daily practice in order to achieve the best possible outcomes from medicines. There is a responsibility and an opportunity for professional bodies and employers to create this culture and environment, as well as the individual's responsibility to seek opportunities to apply data driven care in everyday practice.

2.3 The need for better accessibility and availability of data

The group recognised accessibility and availability of data as considerable barriers to using data. Many respondents to the survey highlighted lack of access to data either through access rights on internal IT systems or external platforms, or simply local data not being shared with individuals e.g. audits. There is an onus on employers to provide appropriate access to data for pharmacy professionals working in their organisation. Practically, this may mean reviewing access rights on internal pharmacy systems, as well as empowering employees to utilise data from sources external to their own organisation such as NHS Right Care, NHS Improvement's Model Hospital, PHE FingerTips, OpenPrescribing.net, PrescQIPP and Rx-Info's Define systems.

“Info isn't made available to me and isn't accessible”

Early career pharmacy professional

Commissioners and providers should consider the discreet data sets that are held and how they might collaborate across the system to make data available where necessary to improve outcomes from medicines.

Employers should ensure that full 'Plan Do Study Act' cycles are completed when audits are undertaken and that results are appropriately shared reviewed and where possible practice is changed.

“Loads of data, finding the best way to use it.”

Early career pharmacy professional

The sheer amount of data available can be overwhelming, turning this into useful information and creating knowledge is the challenge. There are many platforms that visualise data in user friendly and innovative ways that engage and inform at the click of a button. But it is not always clear what is available and where to look. A “toolkit” to inform

and support adoption would help individuals in taking their first steps to using data efficiently.

“Computers and internet connection are so slow everything takes ages to load”

Early career pharmacy professional

Hardware and infrastructure appears to be a barrier to using data in practice. Therefore, organisation should consider the necessary resources to embed data into practice.

2.4 Key Priorities

- Professional bodies and membership organisations such as Royal Pharmaceutical Society, Association of Pharmacy Technicians UK, Primary Care Pharmacy Association and UK Clinical Pharmacy Association should ensure data driven care and wider informatics agenda is a fundamental part of the organisational strategy
- Royal Pharmaceutical Society should create a toolkit to support pharmacy professionals in the adoption of data driven care into practice
- Professional bodies such as Royal Pharmaceutical Society, Association of Pharmacy Technicians UK, Primary Care Pharmacy Association and UK Clinical Pharmacy Association should create awareness of the need for the workforce to become data driven and encourage their members to practice data driven care.
- The Faculty of Clinical Informatics should support the above pharmacy specific bodies (and other professional organisations) with developing understanding of and educational resources to support the introduction of clinical informatics.
- Early career pharmacy professionals should seek opportunities to apply data driven care in everyday clinical practice.
- Chief Pharmacists and Superintendents should improve access to data based systems, informatics expertise and resources.
- Commissioners and Providers should collaborate to make best use of medicines data across the healthcare system and encourage early career pharmacy professionals to contribute to this

3 Domain 1 - Regulation

The regulatory standards for the initial education and training of pharmacy professionals, set out by the General Pharmaceutical Council (GPhC), provides the requirements that UK Schools of Pharmacy must meet to acquire accreditation. These standards play a significant part in the development of curricula to support the learning needs of future pharmacy professionals.

“It needs to be endorsed by GPhC as one of its core concept topics such as patient safety, interprofessional education, placements etc.”

Quote taken from School of Pharmacy survey

3.1 Current Position

Within the current 10 GPhC standards there is no guidance to promote the teaching of data driven care at undergraduate level (Table 1). The only mention of data is focused on monitoring of student progression and course quality monitoring. The application of data and the integration of utilising data sources to improve patient outcomes should be recommended within the standards. It is important that the standards reflect the advances

in healthcare and help equip future pharmacy professionals to utilise new technology and ultimately provide safe and effective care to patients.

Standard	Inclusion of Data Driven Care
Standard 1 – Patient and public safety	No
Standard 2 – Monitoring, review and evaluation of initial education and training	Quality monitoring data from universities, placement providers and other practice learning sources
Standard 3 – Equality, diversity and fairness	Systems and policies for capturing equality and diversity data
Standard 4 – Selection of students and trainees	No
Standard 5 – Curriculum delivery and the student experience	Registration examination progression data Evidence that registration assessment progression data has been used to inform course design
Standard 6 – Support and development for students and trainees	No
Standard 7 – Support and development for academic staff and pre-registration tutors	No
Standard 8 – Management of initial education and training	Systems and structures should be in place to manage the learning of students and trainees in practice. They must take account of: Mechanisms for data collection to support audit of placements
Standard 9 – Resources and capacity	No
Standard 10 – Outcomes	Record, maintain and store patient data
Appendix 1 – Indicative syllabus	A1.4 Core and transferable skills Analyse and use numerical data

Table 1 GPhC Standards for the initial education and training of pharmacy professionals (May 2011)

3.2 International Practice

There have been some notable changes within the provision of undergraduate teaching internationally to incorporate a greater focus on digital technology and the application of data within practice.

The Accreditation Council for Pharmacy Education (ACPE) in the United States recently updated the curriculum standards for Doctor of Pharmacy (Pharm D) in July 2016¹⁹. This was a result of ongoing efforts to incorporate advances in real-world pharmacy practice with more focus on patient-centred care, interprofessional teams, evidence-based practice, quality improvement and digital informatics. The need for the change within the United States healthcare system was highlighted by the Institute of Medicine (IOM) which advised that to improve medication safety and patient outcomes all healthcare

professionals should attain the utilisation of informatics during their education²⁰. The new ACPE standard incorporates a focus on data analyse and the effective use of electronic and other technology-based systems.

Within the competency standards for Pharmacy professionals in New Zealand²¹ there is a domain which promotes the analyses of safety and quality data and information to improve risk management system which reflects continuous quality improvement principles. The standards set out in New Zealand are in place to enable pharmacists to have the required skills and abilities to assume many different functions that reflect the advances in healthcare.

3.3 Other Healthcare Professional Standards

The picture within the current standards for medical schools in the UK is similar to Pharmacy. The General Medical Council (GMC) published five themes within the '*Promoting excellence: standards for medical education and training*' with no specific standard on teaching data driven care²². There is more of a focus when reviewing the Nursing and Midwifery Council's standards for pre-registration nursing education²³.

There is an expectation that all nurses must be able to use a range of information and data to assess the needs of people, groups, communities and populations, and to work to improve health of patients. An emphasis on contributing to the collection of local and national data will help improve knowledge and awareness of this data that can be used during practice.

The Faculty of Clinical Informatics is currently being established as the professional body for all Clinical Informaticians across the UK. This Faculty intends to establish clinical informatics as a recognised and respected profession through publication of standards, supporting revalidation, providing accreditation and other support processes to embed clinical informatics in the wider clinical professions.

3.4 Summary

There is a need for pharmacy professionals to be able to use data to drive the improvement of patient outcomes and utilise technology to its full potential. In order to do this the regulatory standards that undergraduate providers follow should be updated to include principles of data driven care. Further learning and exploring changes in international pharmacy curriculum would be advised. Change to education standards to incorporate data driven care would ensure the necessary teaching for the future generation of pharmacy professionals.

3.5 Key Priorities

- National pharmacy leaders should work closely with the General Pharmaceutical Council to build the application of data driven care and wider informatics into training standards for initial education of pharmacy professionals.
- The General Pharmaceutical Council should incorporate data driven care and the wider informatics agenda into the standards for initial education and training for pharmacy professionals
- The General Pharmaceutical Council should identify the expected outcomes for initial education and training of pharmacy professionals with respect to data driven care and the wider informatics agenda.
- The Royal Pharmaceutical Society should further explore international good practice, via the International Pharmaceutical Federation (FIP) network, to learn

the optimum way of integrating digital training into pharmacy undergraduate and postgraduate education.

4 Domain 2 – Education

The continued advances in IT systems, the growing bank of available data and the need to intelligently interpret this information to achieve the optimal healthcare outcomes for all requires a competent and adaptable pharmacy workforce. In order to have a profession that is competent for the current system and fit for the future appropriate education is needed at all stages of the career both for those entering the profession and to upskill the existing workforce.

“All pharmacists must be literate in informatics, data handling and interpretation if they are to have a future role guiding therapeutics.”

“Our pharmacists must feel comfortable and able to deal with all data systems associated with medication development and the services they provide. Some may eventually specialise in the area but all students should develop basic skills that they can apply in a variety of settings.”

Quote taken from School of Pharmacy survey

4.1 Current situation from undergraduate universities

In order to gain a broader understanding, the UK Schools of Pharmacy were surveyed about clinical informatics and the use of data. Fourteen Schools responded (see Appendix 2), with 85.7% stating that they were providing some education in the area of clinical informatics. Most respondents (78.5%) indicated that they thought clinical informatics education was important (rating its importance as 4 or 5 out of 5). It was concerning that one respondent felt that informatics was unimportant because they were a new School of Pharmacy and therefore it was less important than other topics at this stage. The SLWG recognised an issue with regard to culture in the lack of emphasis placed on the importance of clinical informatics within the curriculum.

When asked to identify the component parts of clinical informatics education for undergraduate pharmacists there was a range of opinions. The majority (>85%) of respondents felt that the use of electronic patient records, electronic tools and information governance were all part of clinical informatics education (Figure 5). Fewer (64.3%) felt that understanding and applying large datasets and conducting research were also included. The results indicate that the most Schools of Pharmacy perceive clinical informatics to focus around the use of IT systems and less on the interpretation and application of data for patient benefit.

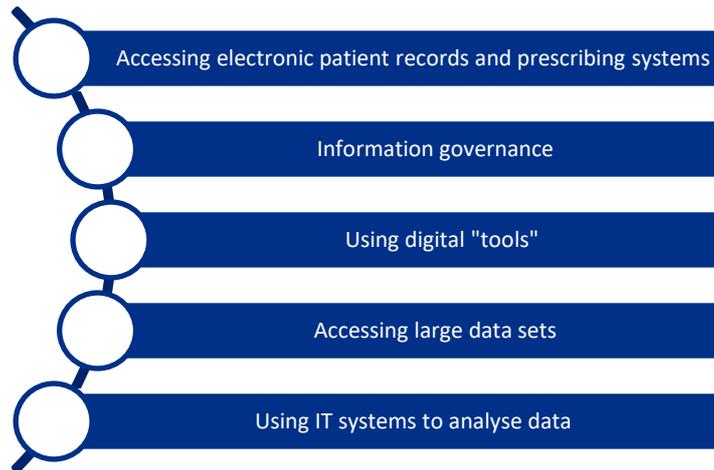


Figure 5 Perceived components of "clinical informatics" in undergraduate education

While the varied interpretation may, in part, explain the wide range in the description of the teaching that is currently offered; it is obvious that significant differences exist between Schools of Pharmacy in the clinical informatics education they offer. Some respondents stated they offered none, some a one hour lecture in some years of teaching and others stated that it was integrated into upwards of 50 hours of content per year.

In contrast to the surveys of Schools of Pharmacy the survey of early career pharmacy professionals, including students, (see Appendix 1) demonstrated that most respondents (87.3%) felt that they had no teaching in the area of clinical informatics or data driven healthcare (Section 3). This highlights the difference in understanding of clinical informatics between early career pharmacy professionals, including students and education providers (Figure 6).

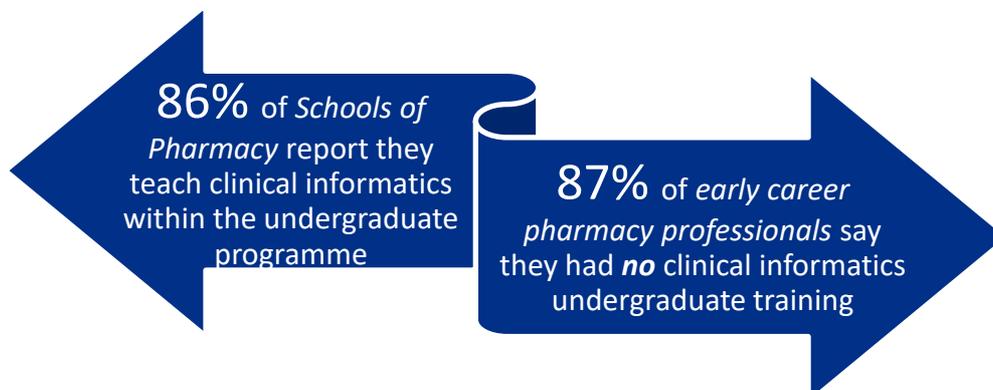


Figure 6 Disconnect between perceptions of clinical informatics teaching

The reasons that explain the differences between the responses of education providers and early career pharmacy professionals are:

- There is variation in the understanding of the term clinical informatics and therefore the same educational content may be considered differently by educators and students, or individuals within the same group.
- Over 70% of respondents from Schools of Pharmacy stated that they had been providing some clinical informatics training for 10 years or less. Almost half the early career respondents were qualified for 7-10 years and an additional 27% were qualified between 4 and 6 years. Accounting for the 5 years taken from

matriculation to registration it is likely than many professionals attended university before clinical informatics was included in the curriculum.

- The regulator does not provide a clear expectation as to informatics skills to develop.

The barriers identified to implementing clinical informatics education for undergraduate pharmacy students included a lack of IT infrastructure and resources, lack of expertise in the educational institutions, competing priorities and lack of political impetus.

It is clear that to develop the required pharmacy workforce better education in the area of clinical informatics is required. To enable this, education providers need clear guidance as to what clinical informatics education should consist of and a standard as to the expected outcomes of this education. A standard set by the regulator would ensure that all pharmacy students get educated to the same minimum standard. Alongside this universities need to develop links to those with the expertise to develop appropriate education and methods of accessing the required IT and data.

The education currently offered to pharmacy technician pre-registration trainees in the area of clinical informatics was not assessed as part of this analysis. New standards for the initial education and training of pharmacy technicians were released at the end of 2017 and work is underway to develop the supporting infrastructure for the apprenticeships. The standards do not explicitly mention clinical informatics but there are related standards e.g. audit. The curriculum for the new apprenticeships has not yet been set and work is under way to include clinical informatics within this. Further work is recommended to scope the current provision of education for pre-registration pharmacy technicians.

4.2 Current postgraduate opportunities

There is an appetite in the existing workforce for more education in the area of clinical informatics with 72.1% of respondents to the survey of early career professionals stating that they would benefit from education in the area. The offering of education is, at present, limited. For those working in areas of informatics at an advanced level there is the Faculty of Clinical Informatics²⁴ and the NHS Digital Academy²⁵.

To support broader healthcare professionals in their development Health Education England (HEE) have developed a digital capabilities framework for health and social care staff²⁶. There are 6 domains and 4 levels within each. One specific domain is focussed on information, data and content literacies. It can be used to identify current level of digital capability and there is a simple online assessment tool in development to support this. This could then be used to identify the needs within specific workforce groups to identify targeted educational material/resources for commissioning. The framework is generic, to help all staff to identify their own learning needs and not linked to any specific systems, tasks or timescales.

There is a need to develop learning packages that will enable the existing workforce to upskill themselves in the area clinical informatics to ensure the best healthcare outcomes for individual patients and the wider population. The development of such learning packages should be led by the professional bodies and supporting education providers.

4.3 How senior pharmacy professionals can support early career staff

The majority of early career pharmacy professional respondents felt that they were encouraged to use data to improve outcomes in their organisation. It was noted that almost half of respondents were seven to ten years qualified and the SLWG acknowledged that those with an interest in data and informatics may have been more like to respond to the survey.

Therefore, while the results are positive, it is important for those in senior positions to continue to encourage all pharmacy professional to seek out, analyse and use data to drive practice at every level from the individual patient to entire populations. In order to achieve this, pharmacy leadership within organisations need a greater understanding of the importance of data and informatics and highlight how it can support improved patient care strategically and operationally.

There is also a need for those who lead services to work with education commissioners and providers to articulate what their current and emerging needs are in terms of the clinical informatics competency of their workforce. This can be used to develop learning packages that deliver the requisite change in the workforce.

It must also be borne in mind that the increased use of data software and the analysis of data may present an additional challenge for members of staff who are disabled. Employers must consider this when implementing systems and make reasonable adjustments so that all staff are able to utilise tools to drive better care for patients.

4.4 Key Priorities

- Academic institutions should incorporate education on data and informatics within their undergraduate and postgraduate courses at all stages (from year one).
- Academic institutions should create links to experts in practice and informaticians to co-produce material and syllabi to ensure the relevance of the topics covered.
- All accredited Schools of Pharmacy to make informatics an integral part of professional development and training such as during practice-based sessions and practice placements.
- Health Education England and the Centre for Postgraduate Pharmacy Education should commission and deliver data driven care training through foundation programmes and improve access to training on using relevant systems/databases.

5 Domain 3 – Professional Development

As demonstrated in the findings from the two surveys (Section 3 and Section 5), there is significant variation in the understanding of the terms “data driven care” and “Clinical Informatics”. Although there are multiple definitions for both the terms, the importance is on using data and information to improve patient care, not simply holding and accessing data. Therefore understanding of the importance and exposure to data in practice are key components of embedding this in daily practice.

This may vary slightly between sectors, though the principles remain the same. If pharmacy professionals are enabled to understand how data driven care is applied in the context of their setting early in their career, they are more likely to embed this in to their practice and develop the skills, knowledge and expertise required to routinely consider how data within the system could be used to drive improvements in the care of patients. There are four steps to achieving this (Figure 7).



Figure 7 The four steps to embedding data driven care

Awareness of what data is currently collected at different levels within the system, relevant to the sector: the department, the organisation, and at regional and national level. A proportion of responders to the survey detailed in Section 2 stated that they were unaware of the data available in their practice. A broad understanding of what data is available (for example financial, admissions, prescribing, monitoring and diagnosis) would help to provide a foundation for the pharmacy professional to start forming a link between these different pieces of data. It is important at this stage to provide examples of how the team already utilises this data to try to inform improvements in patient care. This offers the pharmacy professional

the opportunity to contextualise numbers and figures against outcomes and patient care.

Box 3: An economic analysis of a ward-based dispensing for discharge pharmacy technician service:

This example demonstrates the use of data to ascertain the cost benefit of pharmacy technician dispensing for discharge services in the hospital setting. To enable this, admission data from the hospital patient administration system was cross referenced with the pharmacy drug expenditure data. From the analysis, cumulative savings were extrapolated across the year and demonstrated sustainability of the service based on cost. The team acknowledged the need to link this to quality improvements.

See https://ejhp.bmj.com/content/24/Suppl_1/A160.2 or page 24 https://www.pharmacycongress.co.uk/_media/Saturday-PM-2018.pdf for further details.

Accessibility: making the data systems accessible to the pharmacy professional. Learning within the practice environment is enhanced by the opportunity to explore and use systems. As indicated by the survey results from Section 2, several barriers were

Box 4: Parkinson's disease: Prevalence of missed and delayed medications

This example demonstrates the use of reports from electronic prescribing & medicine administration (ePMA) records to categorise medicines administration for patients with Parkinson's disease in a hospital setting according to administered, missed, delayed and other. This was followed by exploratory analysis, namely comparison of outcome by drug type, route and frequency of administration, and time trends. This has enabled the development of a robust metric to measure quality of hospital care for people prescribed Parkinson's disease medicines, which is used to provide regular performance feedback to wards and enables targeted medicines safety and educational interventions where standards of care need to be improved. See page 24 here https://www.pharmacycongress.co.uk/_media/254-Saturday-PM-2018.pdf for further details.

identified with regards to the utilisation of data in practice, including the difficulty in accessing the data, the lack of support in the use of data platforms and poor technical infrastructure and hardware. Employers and senior pharmacy professionals within teams have a role here in ensuring that steps are taken to overcome these barriers. By offering pharmacy professionals the opportunity to access data across a variety of systems, the practical experience and insight gained by the professional will help them form a deep understanding of how the data can be used in practice and start to create innovative ideas of how the data could drive improvements.

Application: the provision of opportunities to apply their learning and understanding of data in to their daily practice. The SLWG undertook a review of published data to support the use of medicines data to change practice. The examples of data driven care provided in *Box 3, 4 and 5* are published or otherwise shared work of early career pharmacy professionals. Encouraging pharmacy professionals to apply data to drive improvements in care early in their career is a key step in ensuring a complete learning cycle. Without this, the pharmacy professional will not have developed a full understanding of the data driven care process within the context in which they work. The opportunity to apply data driven care to their practice can come in various forms: a senior member of the team may identify an opportunity and guide the early career pharmacy professional through this; or alternatively the pharmacy professional may be facilitated to attempt an innovative idea of

Box 6: Identifying high risk patients for smoking cessation by using community pharmacy data

Bedminster pharmacy used a combination of opportunistic interventions with patients and proactively running reports from PMR system to identify patients prescribed respiratory medicines. Pharmacy staff then talked to these patients about their smoking status and offered smoking cessation services. Twenty-seven patients undertook quit attempts and used switched to nicotine-replacement therapies. Nine patients have now completely quit all nicotine products. Bedminster have also recently established a relationship with respiratory physiotherapy services to refer patients to, and receive referrals for smoking cessation services.

Ade Williams, Manager at Bedminster Pharmacy

their own, with coaching from a senior professional within or outside of their employing organisation. See *Box 3* for an example of an early career pharmacy technician beginning to apply the use of data in to their practice.

Adoption: once the early career pharmacy professional has applied the data driven care approach with sufficient support, there will come a point when this concept becomes a part of their normal practice. Adopting a data driven care approach benefits the pharmacy professional, the service and the patient. Most importantly, this approach leads to improvements in patient outcomes. In addition to this, it can lead to positive changes to service provision (see *Box 4* for an example), create efficiency savings (*Box 5*), offer the opportunity to spread good practice and enable pharmacy professionals to remain at the

Box 5: Development of OpenPrescribing price per unit cost saving tool

This example demonstrates a new method from the *OpenPrescribing* team to identify and enable large potential cost savings within NHS community prescribing. Using NHS Digital prescribing data over a 12 month period potential cost savings were calculated by determining the price per unit for each drug and dose within each general practice. A comparison was used against the cost for the practice at the lowest decile to determine the achievable savings. Within the savings identified further analysis was determined to illicit the saving potential from generic switching of certain medicines. There was a theoretical saving of £410 million identified over the 12 month period with £273 million for individual prescribing changes with over £50 per practice per month (mean annual saving £33 433 per practice). Generic switching accounted for £35 million saving potential. The biggest medicine specific savings nationally were on fluticasone propionate (£9 million) and venlafaxine (£8 million). Using the judgement of a pharmacist half of all the theoretical savings were deemed practically achievable.

See <https://bmjopen.bmj.com/content/bmjopen/8/2/e019643.full.pdf> for further details. .

forefront of healthcare. Using data about medicines and outcomes will support the integration of pharmacy professionals within the wider healthcare team.

The responses to the survey discussed in Section 2 indicate that data systems and tools are used widely to drive improvements to care within the primary care setting. There are few published examples of data driven care in community pharmacy, but Box 6 describes an innovative approach to using pharmacy system data to provide public health interventions.

Encouragement for early career pharmacy professionals to share ideas and work across different sectors can help to ensure that data driven care is embedded in practice and that consideration is given to the patient pathway and the wider healthcare system.

This can be done by through publication, which in addition to sharing good ideas and work; it can assist in building an evidence base within pharmacy practice. Other ways of sharing ideas and work around the use of data to drive care is through active participation of clinical networks.

5.1 Key Priorities

- Senior pharmacy managers must create an environment for early career pharmacy professionals to incorporate data driven care into their daily practice.
- Senior managers to create Data Champions who coach peers, model data driven behaviour and work with Senior Leaders within their organisation to manage data as a strategic asset and promote data driven care.
- Chief Pharmacists and Superintendents to provide opportunities such as grants, for early career pharmacy professionals to be creative and innovative in the use of data.
- Royal Pharmaceutical Society to create a mentorship programme, supported by senior leaders engaged in data driven care.
- All early career pharmacy professionals should utilise resources from professional and education bodies and seek mentorship and expertise if required.
- All early career pharmacy professionals should aim to showcase work using data to drive improvements in care at conferences and symposiums and publish in peer review journals.

6 Domain 4 – Network and Peer Support

Networks are growing in number and importance in UK healthcare. They are ideally placed to tackle systemic and complex problems faced by frontline staff and have already been utilised by pharmacists in a variety of clinical areas.

Research has suggested that such networks contribute to healthcare improvement by providing a forum for experimentation and creating knowledge, exchanging information and spreading good practice. But not all networks are equally effective. It was important to identify from pharmacy professionals in practice, their preferred types of networks and any existing networks which could support data driven care. As part of the work of the SLWG, a review of potential future network options was developed.

6.1 Current Position

Many respondents (68.5%) felt they were able to share good practice with other pharmacy professionals working at the same level. Most respondents (66.9%) indicated that they did not prefer any specific networking or communication tool for the sharing of ideas with others. Amongst those respondents who indicated a preference, a range of tools and methods were used and preferred depending on the purpose. Some indicated a preference for traditional methods of communication e.g. email (local groups), face-to-face meetings and continuing professional development (CPD) events, whilst others preferred a range of mixed media platforms and web-based forums such as, profession or job role specific web-based network platforms and Slack. Closed public platforms such as WhatsApp, Telegram, Facebook and LinkedIn were commonly being used for personal communications amongst known contacts.

There were conflicting views about the use of public platforms such as Twitter as a method for sharing good practice; some felt it was not a good method to reach peers and share examples of practice, as well as the potential of losing information. Others felt it was a great way to reach out to wider networks and contacts.

It was also apparent that there were limited opportunities for networking across organisations **and** across sectors for early career pharmacy professionals, and that this could be useful for improved communication and collaboration beyond individual organisational teams. There are currently similar networks for senior pharmacy teams where good practice can be sought such as the use of the Kahootz platform for chief pharmacists. The content within senior networks focusses on high level strategy and policy which would not be as beneficial towards early career pharmacy professionals.

6.2 Network Options

The SLWG undertook a review of potential options for existing networks within the pharmacy profession in order to identify an appropriate platform to support data driven care.

The various network types in use to support current clinical networks have been identified and analysed within the body of research²⁷⁺²⁸ to understand their advantages and disadvantages for specific types of network. The key focus of the intended network for pharmacy professionals is developmental which requires a closed environment with the ability to share work, seek guidance or support and connect with likeminded individuals and mentors. The network should also be able to highlight and spread good practice between organisations.

Closed mixed media platforms were identified as an ideal way of supporting such a network due to the ability to maintain a coherent conversation, share documents easily, ensure entry of appropriate members and allow rapid transmission of good practice examples. The SLWG group provided recommendations on the suitability of each platform and ranked in order of preference as shown in Table 2 (1= most preferred, 5 = least preferred).

Table 2: Network Platform Options Appraisal			
<i>Platform</i>	<i>Advantages</i>	<i>Disadvantages</i>	<i>Ranking</i>
Option 1: Face to face meeting e.g. CPPE, LPN, Conferences, Roundtables, Workshops	Attracts a wide audience. The ability to network face to face is valuable Rapid idea generation.	Self-selection of "engaged" individuals. Requires leadership structure to organise meetings and set agendas. May skew contributions in favour of certain learner types.	3
Option 2: Web based forum e.g. NHS networks, UKCPA forums, RPS forums	Membership is managed. Ability to share most types of media and collaborate over long distances. Moderation and administration is appropriately resourced through organisation	Disconnect if members do not contribute but benefit from the work of others. Lack of face to face interaction can reduce accountability. Requires web hosting. Requires maintenance. Web access prohibited in some workplaces.	2
Option 3: Mixed media platform e.g. Kahootz, Slack	Ability to share all types of media within a secure space. Ability to generate content from a central source, assign tasks and share learning on a range of devices. Membership is managed.	Complex interface may discourage individuals. Potential difficulties in manual nature of allowing access. Web access prohibited in some workplaces.	1
Table 2: Network Platform Options Appraisal (continued)			
Option 4: Open public platform e.g. Twitter	Easy to access. Wide audience beyond local networks.	Impossible to share complex projects Difficult to maintain coherent conversation.	5
Option 5: Closed public platform e.g. WhatsApp, Telegram, Facebook, LinkedIn, Yammer	Closed group which can be accessed rapidly. Already in use among those surveyed.	Data is stored in a non-secure location. Difficult to govern content	4

6.3 Key Priorities

- Chief Pharmaceutical Officer should commission the development and curation of a network/platform of early career pharmacy professionals engaged in using data to share practice and drive improvements in care.

7 Recommendations

This document has highlighted the steps to embedding data driven care into every day practice and the support required to reach this. This section presents the final recommendations, which are addressed to the Chief Pharmaceutical Officer's senior leadership team, the regulator, professional and educational bodies, academia, employers and early career pharmacy professionals. The choice of these recommendations has been guided by the following considerations:

- The importance of the problem to be solved and the recommendation's ability to solve the problem.
- A judgement about the likely impact of the proposed measure as part of the overall package of proposals.

The recommendations have been drawn from the work undertaken by the SLWG, as well as responses received through surveys.

The recommendations presented in this report provide the framework for further action. The result will be a more sustainable and engaged workforce, which is able to provide data driven care. It is important to note that the implementation shall not stifle the upskilling of other groups of pharmacy professionals but augments the drive to make data driven care ***part of everyday clinical practice across the pharmacy profession and all sectors from the first day of practice.***

7.1 Overarching principles and key recommendations

There are three overarching principles that are considered fundamental to embedding data driven care into everyday practice:

- Enhanced **learning opportunities** should provide a foundation for pharmacy professionals to move from a state of 'data denial' or 'data indifferent' to 'data informed' and 'data driven' and to maintain the skills they acquire.
- A **culture** where data driven care is part of the role of all pharmacy professionals at all career stages must be established or other professional groups will take a lead.
- **Available and easily accessible data** will increase engagement and empower early career pharmacy professionals.

Against this background, the group recommends that:

7.1.1 Chief Pharmaceutical Officer's Senior Leadership Team

- Share the outcomes of this report to relevant professional and educational bodies e.g. Faculty of Clinical Informatics, NHS Digital Medicines Data Advisory Board, Royal Pharmaceutical Society, the Association of Pharmacy Technicians UK, Health Education England and the Centre for Postgraduate Pharmacy Education and members of the profession through existing forums.
- National pharmacy leaders should work closely with the GPhC to build the application of data driven care and wider informatics into training standards for initial education of pharmacy professionals.
- Commission the development and curation of a network/platform of early career pharmacy professionals engaged in using data to share practice and drive improvements in care.
- Appoint a national pharmacy informatics champion to provide leadership and strategic direction to the NHS across England on delivering data driven care.
- Submit the outcomes of this report to the Topol review request for evidence.

7.1.2 The Regulator

- Incorporate data driven care and the wider informatics agenda into the standards for initial education and training for pharmacy professionals.
- Identify the expected outcomes for initial education and training of pharmacy professionals with respect to data driven care and the wider informatics agenda.

7.1.3 Professional and Educational bodies

- Professional bodies such as Royal Pharmaceutical Society, Association of Pharmacy Technicians UK, Primary Care Pharmacy Association and UK Clinical Pharmacy Association should ensure data driven care and wider informatics is a fundamental part of the organisational strategy.
- Professional bodies such as Royal Pharmaceutical Society, Association of Pharmacy Technicians UK, Primary Care Pharmacy Association and UK Clinical Pharmacy Association should create awareness of the need for the workforce to become data driven and encourage their members to practice data driven care.
- Royal Pharmaceutical Society should create a toolkit to support pharmacy professionals in the adoption of data driven care into practice.
- The Royal Pharmaceutical Society should further explore international good practice, via the International Pharmaceutical Federation (FIP) network, to learn the optimum way of integrating digital training into pharmacy undergraduate and postgraduate education.
- Royal Pharmaceutical Society to create a mentorship programme, supported by senior leaders engaged in data driven care.
- Health Education England and the Centre for Postgraduate Pharmacy Education should commission and deliver data driven care training through foundation programmes and improve access to training on using relevant systems/databases.
- The Faculty of Clinical Informatics should support the above pharmacy specific bodies (and other professional organisations) with developing understanding of and educational resources to support the introduction of clinical informatics.
- Faculty of Clinical Informatics should create definitions, competency standards & educational resources for clinical informatics that can be used across the healthcare system.

7.1.4 Academia

- All accredited Pharmacy Schools should incorporate data driven care and the wider informatics agenda into their undergraduate and postgraduate courses at all stages (from year one).
- All accredited Pharmacy Schools should create links to both experts in practice and informaticians within their organisations to co-produce material and syllabi and deliver learning to ensure the relevance of the topics covered.
- All accredited Pharmacy Schools should make informatics an integral part of professional development and training such as during practice-based sessions and practice placements.

7.1.5 Employers

- Senior pharmacy managers should create an environment for early career pharmacy professionals to incorporate data driven care into their daily practice.
- Chief Pharmacists and Superintendents should improve access to data based systems, informatics expertise and resources.

- Senior managers should create Data Champions who coach peers, model data driven behaviour and work with Senior Leaders within their organisation to manage data as a strategic asset and promote data driven care.
- Chief Pharmacists and Superintendents should provide opportunities such as grants, for early career pharmacy professionals to be creative and innovative in the use of data.
- Commissioners and Providers should collaborate to make best use of medicines data across the healthcare system and encourage early career pharmacy professionals to contribute to this.

7.1.6 Early career pharmacy professionals

- All early career pharmacy professionals must seek opportunities to apply data driven care in everyday clinical practice.
- All early career pharmacy professionals should utilise resources from professional and education bodies and seek mentorship and expertise if required.
- All early career pharmacy professionals should aim to showcase work using data to drive improvements in care at conferences and symposiums and publish in peer review journals.

8 Next steps

This report demonstrates that there is a clear desire for early career pharmacy professionals to engage with data driven care and displays examples of benefits to practice and patient outcomes. The SLWG has made a number of recommendations for parts of the healthcare system and individuals to consider.

Exploring the differences between sectors of employment and professional groups was outside the scope of this work. The SLWG recommends further research is carried out to identify specific learning and development needs in relation to data driven care e.g. training, access and use of data sources.

9 Appendices

Appendix 1 Survey - Exposure of Early Career Pharmacy Professionals to Data Driven Care

Appendix 2 Survey – Clinical Informatics in Schools of Pharmacy

Appendix 3 Report – Investigation of the Delivery of Informatics Education and Training to Undergraduate Pharmacy Students

Appendix 4 Report – Perceptions of Early Career Pharmacy Professionals on Data Driven Care

Appendix 5 – Membership of the Short Life Working Group

Name and Role	Organisation or Group/Sector Representation
Andrew Davies (Chair), Hospital Pharmacy Lead	NHS Improvement
Keith Ridge, Chief Pharmaceutical Officer	NHS England
Graeme Hood (Project Lead), Chief Pharmaceutical Officer's Clinical Fellow	Public Health England
Danielle Stacey, Chief Pharmaceutical Officer's Clinical Fellow	NHS England
Naveen Dosanjh, Chief Pharmaceutical Officer's Clinical Fellow	Centre for Pharmacy Postgraduate Education
Emma McClay, Chief Pharmaceutical Officer's Clinical Fellow	NICE
Khola Khan, Chief Pharmaceutical Officer's Clinical Fellow	NHS Improvement
Tahmina Rokib, Chief Pharmaceutical Officer's Clinical Fellow	NHS Digital
Cherise Gymiah, Chief Pharmaceutical Officer's Clinical Fellow	Care Quality commission
Justin Hayde-West, Chief Pharmaceutical Officer's Clinical Fellow	BUPA
Stephen Doherty, Chief Pharmaceutical Officer's Clinical Fellow	Health Education England
Diane Ashiru-Oredope, Lead Pharmacist - AMR Programme	Public Health England
Ann Slee, Fellow of the Faculty of Clinical Informatics and Digital Technology NHS England	Faculty of Clinical Informatics
Chris Cutts, Dean North of England	Health Education England
Richard Seal, Midlands and East Regional Lead	NHS England
Matthew Shaw, Director	Centre for Pharmacy Postgraduate Education

Mary Evans, Chief Pharmacist Luton & Dunstable University Hospital NHS Foundation Trust	Chief Pharmacist representative
Andy Cooke, Practice and Policy Lead	Royal Pharmaceutical Society
Jas Khambh, Pharmacy Advisor	NHS RightCare
Stephen Messham, President	British Pharmaceutical Students Association
Brian MacKenna, Prescribing Adviser, Islington CCG	Primary Care (CCG) representative
Rahul Singal, Associate Director of Pharmacy Kings College Hospital NHS Foundation Trust and SE London STP Pharmacy and Medicines programme lead	STP representative
Rahul Mojaria, Pharmacist - Madesil Pharmacie	Early career community pharmacist representative

10 References

- ¹ NHS England. (2014) NHS Five Year Forward View. [Online] [Accessed 3rd August 2018] <https://www.england.nhs.uk/five-year-forward-view/>
- ² Office of Life Sciences (2017) Life sciences: Industrial Strategy. [Online] [Accessed 3rd August 2018] <https://www.gov.uk/government/publications/life-sciences-industrial-strategy>
- ³ Health Education England (2018) The Topol Review: Preparing the healthcare workforce to deliver the digital future. Interim report June 2018. [Accessed 3rd August 2018] <https://www.hee.nhs.uk/our-work/topol-review>
- ⁴ NHS England. (2017) NHS Digital Academy. [Online] [Accessed 3rd August 2018] <https://www.england.nhs.uk/digitaltechnology/info-revolution/nhs-digital-academy/>
- ⁵ Health Education England. Building a Digital Ready Workforce. [Online] [Accessed 3rd August 2018] <https://hee.nhs.uk/our-work/building-digital-ready-workforce#>
- ⁶ e-Learning for Health programme [Online] [Accessed 22nd August 2018] <https://www.e-lfh.org.uk/programmes/health-informatics/>
- ⁷ University of South Florida (USF) Health What is Clinical Informatics [Online] [Accessed 14th August 2018] <https://www.usfhealthonline.com/resources/key-concepts/what-is-clinical-informatics/>
- ⁸ NHS Digital (2017). Prescribing Costs in Hospitals and the Community, England 2016/17: Report. [Online] [Accessed 3rd August 2018] <https://digital.nhs.uk/data-and-information/publications/statistical/prescribing-costs-in-hospitals-and-the-community/2016-17>
- ⁹ Kongkaew C, Noyce PR, Ashcroft DM. Hospital admissions associated with adverse drug reactions: a systematic review of prospective observational studies. *Ann Pharmacother.* 2008 Jul;42(7):1017-25. doi: 10.1345/aph.1L037. Epub 2008 Jul 1.
- ¹⁰ NHS Digital. Health Survey for England 2016 [Online] [Accessed 23rd August 2018] <https://digital.nhs.uk/data-and-information/publications/statistical/health-survey-for-england/health-survey-for-england-2016>
- ¹¹ NHS England (2017) Medicines Value Programme [Online] [Accessed 3rd August 2018] <https://www.england.nhs.uk/medicines/value-programme/>
- ¹² NHS England Medicines Optimisation [Online] [Accessed 14th August 2018] <https://www.england.nhs.uk/medicines/medicines-optimisation/>
- ¹³ Getting it right first time (GIRFT) [Online] [Accessed 3rd August 2018] <http://gettingitrightfirsttime.co.uk/>
- ¹⁴ NHS England. NHS RightCare. [Online] [Accessed 3rd August 2018] <https://www.england.nhs.uk/rightcare/>

- ¹⁵ Eliot, R. et al. (2018) Prevalence and Economic Burden of Medication Errors in The NHS in England: Rapid evidence synthesis and economic analysis of the prevalence and burden of medication error in the UK. Policy Research Unit in Economic Evaluation of Health and Care Interventions (EEPRU) [Online] [Accessed 3rd August 2018] <http://www.eepru.org.uk/wp-content/uploads/2018/02/eepru-report-medication-error-feb-2018.pdf>
- ¹⁶ Department of Health and Social Care (2018) [Online] [Accessed 20th August 2018] <https://www.gov.uk/government/publications/medicine-safety-indicators-for-safer-prescribing>
- ¹⁷ NICE. (2016) Improving anticoagulation in patients with atrial fibrillation using the GRASP AF audit tool (part of the GRASP suite of tools delivered by PRIMIS in partnership with NHS England) [Online] [Accessed 3rd August 2018] <https://www.nice.org.uk/sharedlearning/improving-anticoagulation-in-patients-with-atrial-fibrillation-using-the-grasp-af-audit-tool>
- ¹⁸ Lord Carter of Coles (2016) Operational productivity and performance in English NHS acute hospitals: Unwarranted variations. Department of Health and Social Care [Online] [accessed 3rd august 2018] <https://www.gov.uk/government/publications/productivity-in-nhs-hospitals>
- ¹⁹ Accreditation Council for Pharmacy Education. (2016) Guidance for the Accreditation Standards and Key Elements for the Professional Program in Pharmacy in Pharmacy Leading to the Doctor of Pharmacy Degree. [Online] [Accessed 8th April 2018] <https://www.acpe-accredit.org/pdf/GuidanceforStandards2016FINAL.pdf>
- ²⁰ Ortiz, E et al. (2002) Clinical Informatics and Patient Safety at the Agency for Healthcare Research and Quality [Online] [Accessed 20th August 2018] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC419407/>
- ²¹ Pharmacy Council of New Zealand, (2015) Competency Standards for Pharmacy Professionals [Online] [Accessed 3rd August 2018] <http://www.pharmacycouncil.org.nz/Portals/12/Documents/standardsguidelines/CompStds2015Web.pdf?ver=2017-02-20-104344-177>
- ²² General Medical Council (2015) Promoting excellence: standards for medical education and training. [Online] [Accessed 3rd August 2018] <https://www.gmc-uk.org/education/standards-guidance-and-curricula/standards-and-outcomes/promoting-excellence>
- ²³ Nursing and Midwifery Council (2010) Standards for Pre-registration Nursing education [Online] [Accessed 8th April 2018] <https://www.nmc.org.uk/standards/standards-for-nurses/pre-2018-standards/standards-for-pre-registration-nursing-education/>
- ²⁴ Faculty of Clinical Informatics <https://www.facultyofclinicalinformatics.org.uk/>
- ²⁵ NHS digital academy <https://www.england.nhs.uk/digitaltechnology/info-revolution/nhs-digital-academy/>
- ²⁶ Health Education England. Improving Digital Literacy [Online] [Accessed 4th July 2018] <https://www.hee.nhs.uk/sites/default/files/documents/Improving%20Digital%20Literacy%20-%20HEE%20and%20RCN%20report.pdf>
- ²⁷ Malby et al (2012). Networks – A briefing paper for the health foundation. Centre for Innovation in Health Management, University of Leeds.
- ²⁸ Malby, B and Anderson-Wallace, M (2016). Networks in Healthcare: Managing Complex Relationships. Emerald Group Publishing Ltd.