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Exploring the implementation of National Guidelines relating to the diagnosis of asthma within two primary care clusters in North Wales: A Case Study Design

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Bangor University

Masters by Research (MRes)

*Exploring the implementation of National
Guidelines relating to the diagnosis of asthma
within two primary care clusters in North
Wales: A Case Study Design*

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Thesis Abstract

The NHS constitution requires that clinicians provide high-quality care that is safe and effective. However, the 2014 National Review of Asthma Deaths report made it plainly clear that patients with asthma were dying preventable deaths and in some cases the failure of healthcare professionals to implement clinical practice guidelines was to blame. Chapter 1 explores the theoretical roots of implementation science in healthcare; chapter 2 a review of the existing literature related to guideline use by clinicians within asthma medicine. Chapter 3 describes our downstream analysis of the use of two national asthma guidelines to understand and to provide an explanation of how healthcare professionals within primary care in a single locality chose and implement these documents. In chapter 4 we present our findings : clinician behaviour was determined not just by familiarity with guidelines and clinical workload, but by each individual's perceived position in a wider social network of clinicians and distinct clinician groups. Furthermore, we found that disempowerment of key staff, an apathy towards improvement or financial worries were strong determinants of behaviour. By exploring attitudes and behaviour in rich detail across this case study area, this research paves the way for rational interventions to improve guideline implementation in this area in the future.

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Chapter 1 : Background, Policy and Context

In 2019, clinical practice guidelines are an entrenched component of the healthcare lexicon. In use across all domains and firmly advocated by both the organisations that produce them and by positional leaders as an expected standard of patient care, clinical guidelines are referred to in academic examinations and considered a means to standardise healthcare provision across national and even international populations. The actualisation and *implementation* of clinical practice guidelines by clinicians working ‘at the front line’ has traditionally been a secondary consideration to their production. Guideline production is a multi-step process whereby research and trial data are translated into statements on best practice. Whilst the results of a trial may indicate a purported benefit of a certain prescription, test or management strategy, the translation of trial data into tangible practice change is not a straightforward or inevitable occurrence. This chapter explores the context surrounding clinical practice guidelines: their origins, the organisations which produce them and their application to healthcare. Also discussed is *implementation science*: its uses and purpose; the manner in which implementation endeavours can be measured; core findings; and the theoretical foundations upon which this broad and practical research field sits. Finally, this chapter explores positioning theory, applying it to my own position as a junior doctor and the influence this has had on my research.

Evidence Based Medicine (EBM)

The principle of “first, do no harm” is a founding maxim of medical education and training internationally. It implores the notion that healthcare professionals must recognise that the existence of a medical procedure, intervention or process *cannot in itself* equate to benefit to the patient and could in fact be a cause of harm to them. Harm could be immediate and obvious or it could occur in a subtle, delayed or unpredictable fashion and includes complications which cannot be easily explained through mechanistic logic. In 1992, the prolific researcher, educator and clinician Professor Gordon Guyatt expanded this notion eloquently and publicly in the Journal of the American Medical Association ; in due course his narrative ignited a genuine paradigmatic shift in medical practice and education (Guyatt *et al.*, 1992). He introduced the term ‘evidence-based medicine’ (EBM) and inaugurated it as a practice framework for clinicians globally. EBM was originally defined as a process that “*de-emphasizes intuition,*

unsystematic clinical experience, and pathophysiologic rationale as sufficient grounds for clinical decision making and stresses the examination of evidence from clinical research". (Guyatt *et al.*, 1992). More recent definitions additionally advocate the inclusion of both patient values and *clinical expertise* too (Sackett *et al.*, 1997). Clinical expertise is a nebulous concept; it describes both the general basic skills of clinical practice and the experience of an individual practitioner. It also implies an ability to balance research evidence with a patient's clinical state, circumstance, and preferences (Hayes *et al.*, 2002). In short, clinicians should not only be aware of research evidence, but they must have the skills to interpret this evidence and then apply it correctly to the patient in front of them. Furthermore, they must bear in mind the patient's desires and communicate evidence to them in terms that they will understand. Presenting information in relative terms to patients is particularly problematic (Malenka., 1993; Hayes *et al.*, 2002).

The outcome of this new paradigm is that clinicians are encouraged to be cautious of practice justified only by tradition or anecdote and to seek instead "high-quality" evidence to demonstrate effect or efficacy. Effectiveness quantifies the extent to which a specific intervention e.g. a diagnostic test can achieve what it set out to do (Department of Health., 1996). A *hierarchy of evidence* diagram is often used to communicate visually to clinicians a framework for categorising published work into low, medium or high-quality evidence based on factors such as reproducibility, risk of bias and use of randomisation methods. The sheer volume and rate at which original literature is published precludes clinicians from being individually able to appraise and synthesise representative collections of relevant publications, even when they work in a clearly delineated speciality (Hewitt-Taylor., 2004). Staff frequently care for patients with multi-faceted health related problems spanning more than one clinical speciality and no clinical role is identical in terms of workload, patient demographic, available resources or staff interest. In view of this, local, regional, national and even international organisations produce statements and recommendations on key topics, that are then made accessible and comprehensible to the non-expert audience.

While EBM remains a worthy goal, there is a need for pragmatism and caution, particularly when factoring in publication bias, translational concerns and real-life patient cohorts who are often polymorbid and do not fit into the neatly defined groups that appear in randomised-

controlled trials (RCTs). RCT and systemic review are taught as the most highly prized components of the EBM hierarchy and typically form the cornerstone of guideline documents.

Clinical Guidelines in Practice

Around the same time that EBM was emerging, so too did a definition for a clinical guideline. Guidelines contain “*systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances*” (Field and Lohr., 1992). Guidelines tend to be developed for topics where a condition occurs very frequently, where there is known variation in practice or where there is an evident potential for health care improvement. Once a topic has been identified, a guideline-development group of experts convene, usually alongside patient representatives, to review the published evidence and devise consensus statements or guidelines. Once produced, these clinical guidelines are assumed to positively influence the quality and effectiveness of care; by providing knowledge about options for care; by blueprinting the course of treatment or intervention; and providing evidence-based standards against which practice and cost can be measured. Guidelines are rarely considered to be absolute, but the definition has evolved in the last three decades and the terminology is now more authoritative:

“When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian” – NICE, 2017.

At least in the UK, clinical recommendations are now produced by a relatively standardised review method of the ‘best available evidence’ from publicly available repositories of published academic literature. Guidelines tend to be updated when new or important evidence relevant to that topic emerges over a period of years, often with joint accreditation from multiple organisations. For example “*Palate examination: Identification of cleft palate in the new-born - best practice guide*” (Royal College of Paediatrics and Child Health (RCPCH), 2014) is published with support by Royal College General Practitioners, the Royal College of

Midwives, the British Association of Perinatal Medicine, the Craniofacial Society for Great Britain and Ireland and a patient advocacy group the Cleft Lip and Palate Association. Alternatively, large international organisations e.g. the European Association of Urologists, produce broad and extensive guidelines which cover the diagnosis, management and monitoring of an entire disease process. Sometimes, an individual guideline production process is additionally reviewed by the NICE and may therefore receive *accreditation* and result in a jointly certified document. On the contrary, at times there is no unanimous agreement between organisations and so multiple guidelines are produced synchronously. Unfortunately, this inevitably introduces conflict and confusion for clinicians. The publication of a guideline must be accompanied by a robust dissemination and education process for the target audience, without which practice is unlikely to change. Furthermore, the intended users of a guideline often need an opportunity to comment on recommendations and have an input into the plan for implementing guidelines.

Rogers' Diffusion of Innovation Theory

Rogers' Diffusion of Innovations (1983) publication lead the way in considering how behaviour and practice change occurs in a cohort of professionals. In healthcare, it is evident that knowledge and information themselves are frequently insufficient to persuade people to change their behaviour. Furthermore, behaviour change occurs in a stepwise approach amongst a cohort: for example there may initially be *innovators* who are willing and active in changing behaviour, but they may be followed sequentially by groups classified as *early adopters*, *early majority*, *later majority* and then eventually *laggards* (Rogers., 1983) . Even earlier work, from three decades prior, explored how practice change occurred in agricultural communities over a period of time, identifying processes that increased the likelihood that behaviour change will occur (Bohlen *et al.*, 1958). The assumption may be that all clinicians want to give patients the best care, however each individual is constrained by professional time and resources as well as individual motivations.

National guidelines can require dynamic adaptation for local use. The majority of clinicians cannot and often do not identify as national leaders – they work instead in a single department of a single organisation e.g. a district general hospital and look after a cohort of patients with a distinct sociodemographic and medical profile. This setting is very unlikely to perfectly

replicate or represent the populations used in published studies which underlie the guideline statements and so a local guideline adaptation process is often required. The local guideline adaptation process must first establish that (i) the guideline is achievable in practice and if so (ii) which of its recommendations can be altered without affecting its rigour and validity (*The Clinical Guidelines Education Team, Nottingham., 2001*).

Implementation science and the National Health Service (NHS)

There is frequently a gap between the development of guidelines and their implementation into practice. (AGREE., 2003; Grol and Grimshaw., 2003; Grimshaw *et al.*, 2004, Greenhalgh *et al.*, 2005; Greenhalgh., 2018; SIGN., 2015). Implementation refers to the act of carrying an intention into effect (Peters *et al.*, 2013). Implementation science is “*the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, to improve the quality and effectiveness of health services and care*” (Nilsen., 2015). Broadly speaking, implementation research takes one of three approaches: describing and guiding research translation (Greenhalgh., 2018); understanding and explaining the relative success or failure of an implementation outcome; and evaluating implementation (Nilsen., 2015). Even in the most resource constrained environments, measuring change, informing stakeholders, and using information to guide decision making is found to be critical in successful implementation (Peters *et al.*, 2009)

The primary step of conducting any implementation process is to consider *context* – the aim thereafter is to understand what, why, and how interventions work within real world conditions and to test approaches to improve them (Peters *et al.*, 2009; Chalmers *et al.*, 2014). The term *context* refers to the social, cultural, economic, political, legal, and physical environment in which an implementation study takes place. Estabrooks *et al* (2006) eloquently describe context as the *landscape* research takes place in. Healthcare landscapes are rarely simple and exist at multiple levels (Estabrooks *et al.*, 2006). Each landscape encompasses individual care providers from different professional groups – each regulated by distinct moral codes and regulatory bodies; patients from across the demographic spectrum; support staff; larger teams; and the wider healthcare structure of the NHS (Estabrooks *et al.*, 2006). Each of these people, groups and systems simultaneously exert and are subject to influences from internal and external factors and function within a resource constrained setting. Furthermore, within and between each level are interactions which affect how a particular guideline is operationalized;

a system is composed not only of the sum of its components but also by the relationships among those components (Holmes *et al.*, 2012; Rashid *et al.*, 2010). If the context forms the landscape of research, then the theory underpinning those research constructs is the road map that allows us to navigate it (Estabrooks *et al.*, 2006).

There is not a unifying grand theory of implementation science, but contributory authors have applied, developed and amalgamated theories from non-healthcare domains including sociology, psychology and economics to inform the development of frameworks and tools for use in approaching a problem in this area. Poor theoretical underpinning makes it difficult to understand or explain how and why implementation succeeds or fails, or to replicate efforts in comparable contexts (Nilsen., 2015).

The NHS is a complex system. Complexity theory was first proposed by Plsek and Greenhalgh (2001) for consideration in health care implementation research. It argues against the reductionist idea that all problems in healthcare can be solved, and instead accepts and values the inherent tension between opposing parts of the system (Plsek and Greenhalgh., 2001). It recognizes that changeable elements, non-linear relationships and emergent behaviour lead to an inherently unpredictable pattern, and so the best way to *know* even a small part of the NHS is by observing it and by finding out how the people who exist in that system experience it (Lorenz., 1993). Subsequent development of Rogers' Diffusion of Innovations theory by the same group has had widespread success in the evaluation of guideline implementation. (Greenhalgh *et al.*, 2005, Rogers ., 2003)^{16,32}

Assessing implementation endeavours

Since the true effect of a treatment, procedure, protocol or pathway in healthcare cannot be seen until it is fully rolled out across a population it is important that localized implementation endeavours can be compared to one another. For example, one intervention may involve the dissemination of e-learning material for clinicians whilst another may involve the employment of face-to-face educators and it is important that these can be compared and contrasted to evaluate effect.

A scoping review of previous implementation endeavours within the field of asthma guidelines is discussed in chapter 2.

The process of designing, executing and reporting this research study has been inevitably influenced by past and present experiences of the main author (FH) – as such a first-person positioning statement is included here to explain this honestly and openly, as a backdrop to the subsequent chapters 2, 3 and 4.

Researcher Positioning

Positioning theory is a constructionist framework that has proved useful in the study of *interactional* practice and *information seeking* activities (Harré *et al.*, 2009; Warren and Moghaddam., 2018). I have been guided to apply it here as a framework for reflexively considering my own role during the study which I have conducted. Comprehensive detail around this theory is not required, but some discussion is necessary.

During the course of my preliminary reading and then subsequent study design, data collection and analysis I have gained increasing awareness that my own education, background, identity and speech will undoubtedly have influenced the design, conduct, analysis and conclusions of this study. As Warren and Moghaddam (2018) report, there is no stepping outside of the continuous process of social identify construction. A key notion of positioning theory is that “*humans are agentic, evaluative beings who continually position self and others in relation to relevant others and according to communally negotiated understandings of right and wrong, good and bad*” (Moghaddam and Harré., 2007) and this easily applies to me and the interviewed participants as I explore and discover qualitative research, considering for the first time that even in a research setting, researchers and participants *position* themselves in relation to relevant others and attend to a perceived normal. Positioning theory comprises three analytical lenses which helps explain how two individuals or cultures may come to radically different conclusions, or ‘storylines’, on the basis of the same objective evidence (Warren and Moghaddam, 2018). It helps a researcher understand how some practices and speech-acts are understood as rational by one and irrational by another (Warren and Moghaddam., 2018).

Positioning theory challenges approaches which treat an individual as a passive medium through which independent variables exert force; it supports instead that the act of assigning – or *positioning* – a role or roles to individual speakers during the discursive construction of personal stories is what make a person’s actions intelligible to others (Harre and van Langenhove., 1999). In addition, positioning theory assumes that these so-called storylines are being constantly challenged, negotiated and transformed in social interactions (Warren and

Moghaddam., 2018). Positioning theory considers what constitutes normative behaviours for given individuals and group. Often, two parties do not agree on different aspects of justice; such as who has a *right* to what and who has a *duty* to whom (Warren and Moghaddam., 2018). A *right* is a demand placed on others by the person who possesses it and a *duty* is a demand placed by others on the person who owes it (Warren and Moghaddam., 2018).

The analysis of positioning can contribute to the study of the information practices occurring within everyday conversation, but so too can it apply to the clinical interaction e.g. the *right* to make a diagnosis is not equal between the professional and the patient. The two participants therefore occupy different discursive positions, and it is necessary to consider the ways that speakers position themselves and each other in order to understand the social meaning of what they say (Mackenzie., 2004). Mackenzie et al. (2004) explore this within healthcare setting when they consider the interactions between midwives and pregnant women. Inevitably the application of positioning theory is not limited to the interaction between a patient and their clinician, it will also be the case between clinical researchers and study participants who are also healthcare professionals. Relative positions can construct individuals and groups in a way that have real effects on information seeking endeavours.

In much existing literature, including that which is explored in the scoping review which follows, participant responses are analysed strictly and with respect only to the independent variables selected by the research. Unfortunately, this enables statistical manipulation of data items, it also underplays and perhaps ignores the reality that participant activities or responses are likely to be contingent on concerns not operationalized as independent variables and not evident in the experimental setting. Participants do not cease to be socially embedded or normatively orientated even when in a research study.

Researcher Preface

The work of researching and writing this thesis was undertaken on a part time basis (20% pro-rata) over a 15-month period, during which time I was working clinically as a foundation year two doctor in the UK Foundation Programme. The educational supervisor within the hospital was the local lead for asthma care and suggested a topic looking into the provision of diagnostic asthma services locally. From that point however I was largely guided to work independently

but sought help to determine the project title with the help of nominated non-clinical academic supervisors, with interests in implementation science and in primary care research respectively. The product of these three supervisory influences, alongside having the time to open books to make more transparent the previously opaque world of qualitative research, was a thesis which looked at the human side of health service delivery. Furthermore, being unblinkered from my ignorantly reductionist view of scientific endeavour as just a means of generating facts and instead learning how to explore a constructed reality, I hope that I will be a better physician. I'd like to say that this process has taught me skills in observing without immediately evaluating and have moved into a post-positivist and even constructivist mindset. In my future career as a general practitioner I will endeavour to value, empower and include my nursing and medical colleagues equally to prompt collaboration and to benefit our patients. I also hope to not underestimate the importance of educational interventions to help staff understand the 'why' behind expected practice, moving beyond just 'how' do I do that test. Reviewing some of the key components of my own learning and development including the following two dilemmas, which I use here as examples of reflexive learning.

Dilemma 1: What is my own epistemology?

At the start of this research process I had little experience, understanding or grasp of many core sociological, philosophical or psychological concepts but even after brief discussions with my tutors, I realised how much I wanted to learn about these areas and so set about a period of many months of reading and thinking during which time I was writing my research proposal. Prior to this I had completed an undergraduate Masters in Medical Science based in a physiology laboratory and so had set expectations about what research looked like and felt like. I hadn't realised what a narrow frame this had established in my mind around what 'research' was. I was ignorant enough as to be completely unaware of my own epistemological standpoint as one of Comte's positivists. I admit to having spent little time seriously considering the unique value that qualitative or social sciences research have. Learning, considering, questioning and then exploring these areas even at the elementary level required for a masters level project has been much akin to learning a new language for me. But what an enjoyable revelation! With guidance I have gained insight into the limited standpoint of a tunnel-vision positivist stance from which I first started. I better appreciate the influence of social constructs

on knowledge and accept the inevitable complexity and nuance of working with and studying human subjects.

Dilemma 2: Duplicity – A junior doctor and an academic

Each of the clinicians I interviewed as part of the study was aware that I am a junior doctor and one that is working under the supervision of a respiratory physician. For some participants, this could have resulted in them allocating me to a position whereby there is an assumption of detailed knowledge or experience with asthma care or a perception that I am a part of the wider respiratory team and may therefore have an ability to influence service provision . For other clinicians my status as a foundation year two doctor equate to me occupying a position of naivety and inexperience. Either way, clinicians' perceptions of my role may have impacted their behaviour during the interviews.

CONCLUSION

In summary, the translational of published research evidence into agreed guidelines which are accessible, useable and used by healthcare professionals is not a straightforward process. The NHS is an organisation undergoing profound change; in addition, during the careers of many clinicians currently in practice there has been a genuine paradigmatic shift in the approach to the diagnosis and management of clinical phenomena and the application of best practice guidelines to improve patient care. Exploring how guidelines are *actually* received, understood, operationalized and implemented by clinicians within a tightly bounded local context is just as important as the publication of high-quality guidelines themselves. Without this downstream analysis, the true magnitude of improvement in the care delivered to patients as achieved by the publication of guideline material cannot be understood.

Chapter 2 : Scoping Review

ABSTRACT

Background National review papers have revealed that the management of asthma in primary care is not concordant with published national guidelines. **Objectives** To explore the literature relating to the application of theory, methods, implementation approaches and determinants in assessing performance in primary care services **Methods** A scoping review using a recognized framework and population, exposure, outcome method to account for the breadth of data from major databases **Results** Inadequate delivery of asthma guideline activities in primary care is global and multifactorial. Interventions to improve education, distribute workload among staff groups and encourage system level collaboration appear to be the most successful approaches. Isolated technological interventions do not significantly alter staff behaviour **Conclusion** Future studies of mixed-methodological approach should explore upstream determinants as well as patient outcomes.

BACKGROUND

Asthma is a common, chronic and potentially serious medical condition affecting 300 million people worldwide (Global Initiative for Asthma [GINA], 2017); with 4.3 million adults (1 in 12) and 1.1 million children (1 in 11) affected in the UK alone (Asthma UK, 2016).

The aim of effective asthma care is to control and minimise the burden of symptoms and to prevent exacerbations; this requires consistent effort and input from the patient (and their family) and adequate support from the health care system to empower and enable them to do this.

There have been attempts since the early 1990s to produce, regularly update and disseminate written guidelines so that professionals involved in asthma care are able to follow a standardized approach to better treat this condition and limit unacceptable variability. Organisations producing such documents include: The Global Initiative for Asthma (GINA), set up in 1993 and part funded by the World Health Organization (WHO) ; the National Asthma Education and Prevention Program (NAEPP) and the National Heart Lung and Blood Institute

(NHLBI) in the USA; NICE, Scottish Intercollegiate Guideline Network (SIGN) and the British Thoracic Society (BTS) in the UK. Whilst these organisations set out with genuine intentions to improve the health of patients, there is inevitably a significant and complex cascade of events which must follow from the compilation of a document in one moment to the changing of clinician behaviour the next.

Asthma care guidelines are written by collectives of experts ; healthcare professionals with a particular interest and role in asthma as a medical entity. Depending on the organization, the guideline development process may also involve variable consultation with patient representatives, health economists and other non-clinical staff in order to produce a document which is felt to be affordable, acceptable and workable for its target audience.

This nominal audience includes clinicians who manage asthmatic patients in primary, emergency or tertiary care; commissioners who delegate resources to care provision and patients/families. The guidelines produced are based upon the what is perceived to be the best available evidence at the time of discussion. As it stands, we cannot fully understand what leads clinicians to a decision in the first place. An analytical or deductive approach to this problem is perceived by many to come at the expense of inductive work which might help explain why clinicians do not, or cannot, adhere to perceived standards.

The evidence base medicine (EBM) paradigm has undoubtedly improved healthcare outcomes, yet credible reservations exist about the validity of hierarchical levels of evidence and the existence of potential and actual methodological deficiencies (Seshia and Young, 2013). As the field has recognized this, the contribution of the qualitative research paradigm alongside quantitative work has evolved.

The literature base pertaining to the use of formal clinical practice guidelines by healthcare professionals within asthma care is enormous. This literature review seeks to reflect the richness and breadth of this work, using an established scoping review methodology. This approach includes primary studies from broad methodological backgrounds and disentangles the evidence to its key parts. There are different epistemological principles from which to try and improve guideline usage so that less people suffer with or even die from asthma, but pragmatism seems a reasonable place to start. Field theory from psychology can be translated

in this setting and surmises that enforcing change without addressing barriers to change leads to increased tension with little or no gain.

AIM AND OBJECTIVES

The aim of this review is to map the research activity surrounding the exploration and modification of guideline implementation practice in asthma within primary care.

The objectives are to identify and explain:

- The application of theory to research design;
- The range of research methods used to assess asthma guideline usage;
- The approaches taken to modify guideline implementation;
- The key factors which impact upon guideline utilization.

METHODS

This scoping review draws upon published guidance on scoping reviews, utilizing the Arksey and O'Malley Framework (2005). In view of this, this work does *not* seek to rank data hierarchically as is done with the systematic review and nor does it seek to assess the weight of evidence– but to instead adopt a narrative approach so that the breadth of published research is accounted for.

Search Methods

Articles were gathered from major databases: PUBMED, CINAHL, ASSIA and COCHRANE (1998 – 2018). The search terms 'Asthma', 'Guideline', 'Implementation' and 'Primary Care OR General Practice' plus any truncations were used. Each of the three groups of terms were connected with 'AND' and alternative terms within the same group connected with 'OR' [Table 1]. Citations were directly imported into Endnote X6 and duplicates removed. Studies were selected if they met: population, exposure, outcome (PEO) criteria [Table 2]. No exclusions were made in relation to quality or methodological approach.

Table 1 : Search Terms

Implementation	Asthma	Guideline	Primary Care
Methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice to improve the quality and effectiveness of health services and care.	A disease characterized by recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person. Symptoms may occur several times in a day or week in affected individuals, and for some people become worse during physical activity or at night.	A recommendation or group of recommendations on how healthcare professionals should care for people with specific conditions.	Primary care includes general practice, community pharmacy, dental, and optometry (eye health) services.

Table 1 : Definition of key search terms used in the scoping review process. Of note, the definition of asthma given here is that of the World Health Organisation (WHO) and is based on it's clinical symptoms alone and is perhaps the description best recognised by those who suffer it.

Table 2: Study Inclusion Criteria

P Population	Professionals working in primary care involved in the delivery of asthma care in the community
E Exposure	Assessment of/intervention pertaining to asthma guideline implementation
Q Outcomes	Implementation outcomes (acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration, sustainability)

Table 2 : The P.E.O framework is useful way to provide definition and clarity in terms of study selection. If a study does not meet each of these three criteria, it was excluded from the analysis as it was not likely to provide relevant results for this research question.

Data Sifting

Relevant data was selected by the screening of published titles, abstracts and where relevant full texts [Figure 1]. Reference lists were scanned for additional relevant publications. The search strategy and data sifting process produced a total of 35 relevant studies which fulfilled the PEO criteria and were accessible in full format from either University or NHS library resources.

Data extraction and Charting

Once the review process was coherent, a Microsoft Excel spreadsheet was populated to organise study data in relation to the research questions.

Figure 1: Data Sifting Process

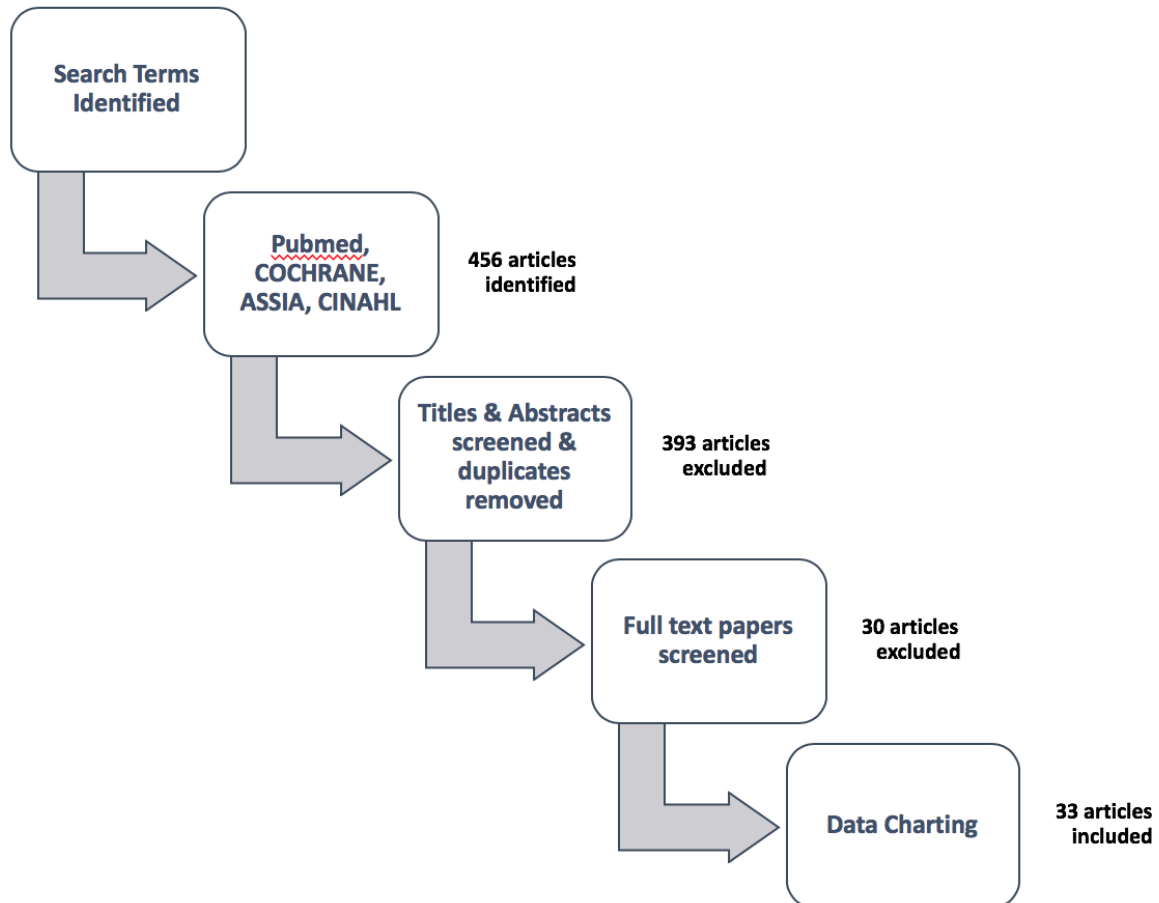


Figure 1 : A flow chart representing the 5 sequential steps undertaken to identify the most relevant research work from the major research repositories COCHRANE, ASSIA, PubMed and CINAHL which were available with library support. This strategy allowed for a broad and comprehensive assessment of a breadth of research but preventing the detailed screening of irrelevant or duplicate publications.

RESULTS

The scoping review results are presented below. The results are organised as response to the four primary research questions, each of which is set out at the top of each section.

Question 1 : What is the theoretical grounding for observational and interventional research in this area?

The target population of the papers included in this scoping review was that of healthcare professionals working in primary care environments involved in the delivery of asthma care. Some of the studies included additional work on secondary care providers and patients for further data. The broad search criteria meant studies from all over the world contributed. This gave an impression of the work happening in both publicly funded and insurance-based healthcare systems, across both rural and urban populations alike; and in highly developed collaborative care networks such as is seen in Finland (Haahtela *et al.*, 2006)

Terminology was variable in the literature. *Primary care* is a well-recognized concept in the UK : it constitutes the ‘front door’ of the NHS and provides communities with local services including surgery’s, dentists, opticians and pharmacies. This is in contrast to *secondary care* which is typically provided at hospitals and is accessed via referral from primary care or via emergency departments (ED). A general practitioner (GP) in the UK is a doctor who provides care in the community for all patients residing there as and when they need it. By contrast, in the USA this job role is conducted by someone referred to as a *family doctor* or *family physician*, but patients also have direct access to specialists if they wish without requiring referral. Furthermore, in one study the authors distinguished between a “family physician” and a “general practitioner” but these terms are synonymous in the UK (Almutawa *et al.*, 2014). The geography of healthcare is a separate topic, but it is important to consider what does and does not currently constitute ‘usual care’ within a given environment, as the job role of the clinicians and thus the context in which they are trying to follow guidelines can vary.

There was a strong preponderance towards studies looking at professionals involved in the care of children, perhaps to be expected given the prevalence of asthma among paediatric cohorts. However, some studies excluded children with severe asthma or another major illness (Lozano *et al.*, 2004). Cohort sizes varied substantially depending on methodology, for example Wiener-Ogilvie (2008) looked at 31 GP practices in the north of England whereas other authors conducted detailed interviews with just a handful of clinicians from a small cohort of practices.

Figure 2: Geography of Included Research Studies

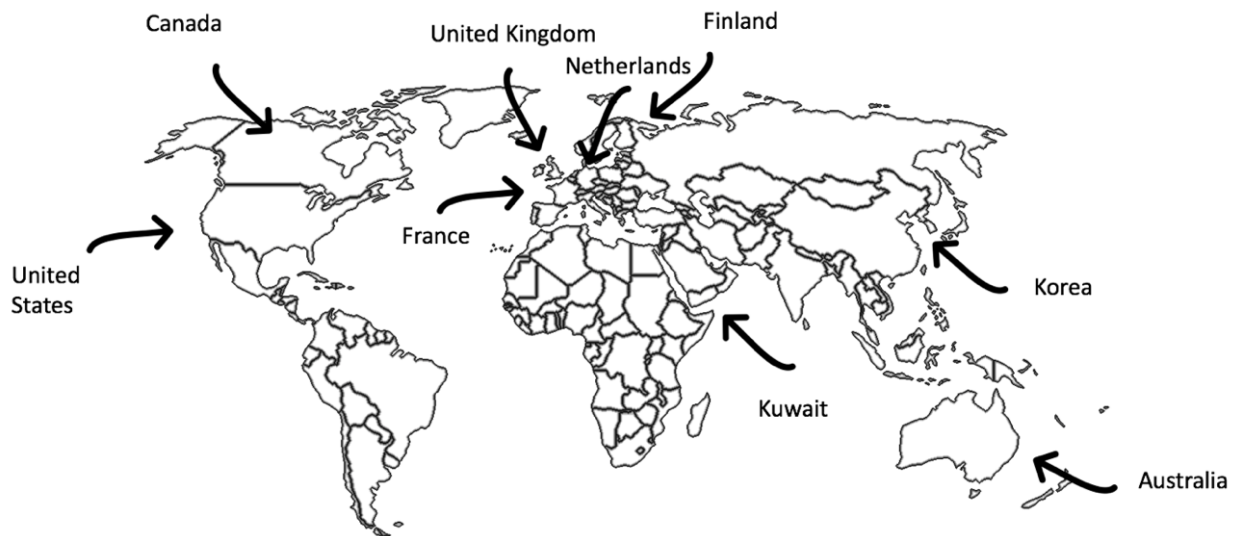


Figure 2: Infographic showing major locations that research into guideline implementation has been conducted globally. This demonstrates that this is an issue not only for UK clinicians but for clinicians wherever there are patients needing diagnostic care.

The bulk of the research had been conducted in the United States, Canada and the United Kingdom [figure 2]. Of the studies done in the UK, the majority took place in the North of England or in Scotland. There were no studies looking at the behaviour of Welsh clinicians. Target practices varied in their set up – some were single-handed and run by a lone general practitioner, other sources of data were large teaching practices with a partnership of doctors, senior nurses, pharmacy and managerial support (Yawn *et al.*, 2008). In some cases, practices were excluded based on a lack of a specific computer system, a single-handed set up or if they could not meet minimum thresholds for asthmatic patients (Homer *et al.*, 2005). Recruitment of participants typically involved the use of postal or e-mail services, although in some cases purposive sampling took place with guidance from local asthma leads or involved the recruitment of clinicians attending educational events (Kang *et al.*, 2010). Some authors had significant hurdles with recruiting physicians to participate– for example Roydhouse *et al* (2011) approached a target population of 1200 GPs within greater metropolitan Sydney but only 15% expressed interest in being involved and their final cohort was just 122 in number. Use of telephone recruitment was a key component in many studies but was often associated in high attrition rate. Telephone calls were made to both clinicians and patients in the studies where patient reported outcomes were included. For example, in Lozano *et al* (2004), 7052 children in a given locality were identified as eligible participants in a study looking at the

implementation of NAEPP asthma guidelines. Only 75% of these families were contacted (n = 5289) and of these 42% refused to partake and 33% were ineligible, leaving just 1323 families before the randomisation process had begun. There was little discussion in the body of the text as to the potential additional bias that this loss of participants introduced in what was already a highly selective study. Issues with recruitment was not limited to conversation-based data collection methods, factoring in studies which were questionnaire-based formats. Within the work of Baker *et al* (2003), 63% of asthma patients returned their questionnaires – the authors suggest that there was no discernible difference between the patients who were and were not consenting in terms of their demographics or their “satisfaction with care”. However, it is not clear from the paper how the patients who didn’t respond to the questionnaire were judged to be “satisfied” or not.

Use of theory

There was a mixed distribution of work: 17 studies were considered as purely quantitative; 10 qualitative; and 8 of mixed methodological approach. Qualitative methods were primarily focus group and face-to-face interviews. As is the tradition in quantitative studies, great efforts were taken in many cases to control for variables which might have influenced outcomes. By contrast, much of the qualitative work did not involve controlling any factors, instead based on observing and gathering information about the use of guidelines in a real-world setting using purposive sampling methods.

Amongst the qualitative work there was variable and inconsistent use of theory in the design and conduct of relevant studies, with the main examples discussed below. Rarely did the authors fully declare their epistemological stance within the published work, although it could be suggested that many took an implicitly phenomenological approach in trying to understand the participants lived experienced and how participants themselves were making sense of their experiences of delivering or receiving asthma care.

Rashidian *et al* (2008) alluded to behaviour change theory in their discussion and to the importance of qualitative research in understanding guideline implementation issues but did not directly refer to theory in their study design framework. However, a subsequent paper by the same group four years later explicitly applies the theory of planned behaviour (TPB) to this

area (Rashidian & Russell, 2012). TPB relates to behavioural intent. It suggests that behavioural actions are influenced by a person's attitude regarding the *likelihood that the behaviour will have the expected outcome and the subjective evaluation of the risks and benefits of that outcome*. In this context, any guideline related activity could be considered a behaviour action. The authors used TPB to devise a questionnaire on current practice and then correlated this with actual prescribing behaviour as recorded on a computer system. This design relies on the assumption that a person's behaviour is influenced by three factors. The first is *attitude* towards that behaviour (e.g. prescribing an asthma medication according to guidelines), the second is the *perceived social pressure* (e.g. what would important others such as practice nurses or GPs expect of them) and the last is the *perceived control* (i.e. how confident are they are being able to do that correctly). They reported in this survey that clinicians followed the guidelines in half of cases. Nearly half of the variance in intention was explained by perceived control and subjective norms, with little influence from the attitude's domain.

Licskai *et al* (2012) used the Canadian institutes of Health Research (CIHR) knowledge-translation framework (KTF) in a case-study publication where they explored and attempted to reduce the guideline-to-practice gap in asthma care in Ontario, Canada. They characterised knowledge translation as the process "*connecting the researcher to the knowledge user*", linking research to daily clinical practice. They used the KTF as a four-step process to guide their implementation endeavours: adapting knowledge to local contexts, selecting and tailoring implementation interventions, devising an asthma management program with an associated care model and finally sustaining knowledge. They acknowledged explicitly the need to focus on multi-level health system change prior to modifying patient level implementation. Gagne and Boulet (2018) also use a Knowledge-to-Action when evaluating Canadian primary care workers.

Wisnevesky *et al* (2008) applied a Knowledge, Attitudes, Behaviour Framework (Woolf *et al.*, 1993) to evaluate barriers among healthcare providers to the adherence of asthma guidelines. This framework relies upon that premise that lack of adherence can be explained as a product of internal and external barriers. Internal barriers affect underlying knowledge, attitudes and practice style, whereas external barriers act to restrict a clinician's ability. This study looked predominantly at internal barriers, using Woolf's framework to devise Likert scales.

Tennen *et al* (2009) make a novel contribution and explored the application of “Hope Theory” to the use asthma guidelines by primary care physicians. According to psychological theory, *dispositional hope* is a goal related construct. This is based on the construct that everyday behaviour is predominantly goal directed and Snyder *et al* (1994) originally developed a cognitive model of hope as a contributing force of goal directed behaviour. Hope, as described, comprises both *pathways* and *agency thinking*. Pathways thinking is when an individual believes they can generate a goal via several different routes. If they encounter a barrier on one route, a high hope individual can select an alternative route or apply a new strategy to achieve their goal. By contrast agency thinking relates to an individual’s thoughts about their ability to move along a given pathway i.e. their ‘will’. Historically these two facets of hope theory for a given individual have been assessed using a hope scale. Tennen *et al* (2009) looked to test the hypothesis that physician’s high in hope are better able to overcome obstacles to reach their goals as compared to so-called “low-hope” individuals. High hope individuals classically possess both self-efficacy and conscientiousness. They assessed these using surveys and correlated this against the primary outcome measure i.e. number of children recruitment with asthma to the Easy Breathing program. Easy Breathing was a program devised by Cloutier *et al* (2004) to improve adherence and is discussed elsewhere. Tennen *et al.*, (2009) hypothesized that high hope clinicians would recruit more children to guideline concordant asthma management program. The authors did demonstrate that individual physicians with lower levels of agency thinking were more prone to fail at delivering guideline concordant care using the Easy Breathing tool than individuals with higher levels of agency thinking. Furthermore, when there were obstacles to this e.g. delays in patient care or lack of freedom, the high hope individuals were more resilient whereas low hope individuals showed a steep decline in agency as the number of perceived obstacles increased.

Over time there has been a transition in the literature to increasing use of theory in study design and also greater use of mixed methods approaches which combine qualitative and quantitative data. This perhaps mirrors a wider change in healthcare implementation research, whereby there is now greater currency attributed to *using theory to drive knowledge forward* and produce robust and reproducible data.

Question 2 : What methods have been used to quantify current asthma guideline use in primary care?

The review process identified a wide range of both direct and proxy measures that researchers have used over the last three decades to assess the concordance of physicians, nurses and other healthcare professionals with nationally recognized asthma guidelines.

Clinician Surveys

The most frequently reported tool for measuring use of asthma guidelines was asking clinicians to rate their own performance against guideline standards, typically using a non-administered survey with Likert scales or fixed choice response items. Items usually contained abbreviated versions of key statements extracted from guideline documents and clinicians were asked to rate how frequently they carried out that specified task for their patients. A real concern with questionnaire-based data collection is the role of *socially desirable response bias*, whereby participants select the option which they feel is acceptable, rather than giving a true answer about their behaviour at work.

Over the years from which the included research spanned, there was various different methods used to distribute surveys – some were paper based and some online or via email. In many cases surveys were distributed to whole cohorts of registered clinicians within a given locality using a mailing-list strategy, but others sampled attendees at asthma training courses. If a training opportunity was not mandatory studies disproportionately represented the behaviour of clinicians with a specialist interest in asthma, rather than true generalists. A recent paper by de Bruin *et al* (2018) involved the distribution of online surveys to 276 healthcare professionals (HCPs). This study compared guideline related activities between British and French HCPs and the behaviour of physicians versus nurses. They found that nurses delivered – or reported doing so - more consistent and guideline concordant care than their physician colleagues. This contradicts that reported by Roydhouse *et al* (2011) where 15% of physicians reported that nurses were *less* effective than doctors at delivering asthma counselling and education.

The proportion of UK HCPs reporting that they were using at least some of the NICE (2017) or BTS/SIGN (2016) guidelines was 98.3%, significantly more than the 66% of French HCPs

using asthma guidelines. De Bruin *et al* (2018) identified that only 5.8% of HCPs reported that they were delivering *all* guideline recommended activities and HCPs reported that they could only achieve 75% of guideline prescribed activities. This raises the question that are any of these guidelines absolutely achievable? It seems this may be problematic within other European healthcare systems too. The use of a validated asthma symptom questionnaires was reportedly much higher among British HCP. This may be because many have been developed by US research groups and so the common language weighs favourably toward their use in the UK.

Some questionnaires had been previously validated in other work; with demonstrable reliability and internal consistency, but for the most part the questionnaires were compiled by authors on a novel basis. Gagne and Boulet (2018) used a 14-question questionnaire and respondents were asked to assess “*for what percentage of patients do you perform this activity*”. Wisnevesky *et al* (2008) used a similar method, asking 202 primary healthcare providers in East Harlem, New York to self-report their adherence to a number of NHLBI guideline activities using a validated questionnaire. This including questions relating to the use of peak flow meters, drug prescription, conduct of allergy testing and vaccination. The mean reported adherence to asthma action plans was just 9%, whereas the figure was 73% when physicians were asked about vaccination (Wisnevesky *et al.*, 2008)

Roydhouse *et al* (2011) looked at the reported agreement (using collapsed Likert-scales) of GPs with five sets of statements relating to: familiarity with guidelines, frequency of self-reported conduct of guideline associated activities, attitudes towards asthma management and the role of nurses and finally their level of confidence at undertaking guideline related tasks. 70% of the surveyed GPs reported they were at least somewhat familiar with the Australian asthma guidelines but again there was poorly concordant reported activity in relation to the provision of written action plans, with only 45% providing them frequently.

Wisnevesky *et al* (2008) report that junior resident physicians and doctors managing relatively fewer asthma cases were statistically lower in compliance, particularly in the delivery of prescriptions for inhaled corticosteroids versus their fully registered counterparts (56% versus 86%, $P < 0.05$).

Tumiel-Berhalter and Watkins (2006) conducted a survey of 89 asthma care providers in Buffalo, New York with a response rate of 53%. They studied the self-reported adherence to 6 guideline domains from the NAEPP document. Adherence to domains relating to spirometry, symptom severity and asthma action plan use respectively was patchy at 53%, 46% and 73%. By contrast, clinicians reporting that they felt positive towards these domains (80%, 84% and 89%). Other components of the guidelines, such as use of anti-inflammatory inhaled medication, were reported to be carried out much more frequently. On further enquiry, these figures were generated from a dichotomized Likert scale which had 4 points. The item response options “always” and “sometimes” were converted to a “yes” with “rarely” and “never” converted to a “no”. This data polishing adds little to the richness of the literature.

Almutawa *et al* (2014) made a unique contribution in reporting physician use of asthma guidelines within the Kuwaiti healthcare system. They also used a questionnaire approach to glean information about physician behaviour across two out of five healthcare districts in Kuwait. They gathered data from 250 physicians out of a total target population of 453, although how they approached them is not clear. Furthermore, this group also gathered information on physician demographics such as marital status and it is not clear how this relates to adherence to asthma guidelines. Whilst described as a survey, essentially it was a test in an administered format and doctors completing the questionnaire were dichotomously described as adherent (37%) or non-adherent (63%) afterwards. The authors attempted to correlate performance with demographic variables but found no significant correlations. This study also enquires as to where physicians were sourcing their guidelines, which is reported in surprisingly few of the other included studies, with respondents mostly reporting their guideline knowledge arose from “practical experience” and “literature and textbooks”. The sources titled “mass media” and “colleagues” were considered to be less influential. It is not clear which asthma guidelines are in question here and therefore difficult to compare the behaviour of this population with other cohorts internationally.

The use of the survey as a data collection tool in this field didn't just relate to behaviour in routine practice, surveys were also used to comparatively assess knowledge before and after educational interventions. Lougheed *et al* (2007) delivered evening workshop sessions to 2783 HCPs in Ontario, Canada and assessed their ability to manage a written asthma case before and after the intervention. The intervention is discussed in more detail below. Whilst all

respondents successfully identified poor control and 96% correctly distinguishing asthma from chronic obstructive pulmonary disease (COPD), again there was significant difficulty with demonstrating asthma action plan usage. At baseline only 70% of surveyed clinicians could complete an asthma action plan correctly even when they were given a form to provide their response. Whilst this study is useful as it allowed physicians to demonstrate what they do *know*; it cannot be considered to represent what they truly *do* in their daily clinical practice. Furthermore, of the 2783 attending only 38% completed the baseline survey and there was patchy completion of all the components of the questionnaire which persisted into the follow-up surveys too.

Interviews

Another tool used to assess guideline usage was the semi-structured interview. This included interviews with clinicians, administrative staff and with patients. Topics included asthma action plan usage (a key guideline component in virtually all national guidelines) and the perception of guideline related activities by clinicians and patients. There is remarkably little repetition or duplication of effort across the literature base. For example, Ring *et al* (2015) and Rousseau *et al* (2003) were each interviewing clinicians, but in Scotland and England respectively. Ring *et al* (2015) dug into the values of patients and professionals towards asthma action plans, whereas Rousseau *et al* (2003) looked specifically at the experience of professionals of using decision support technology and computers to deliver asthma guideline concordant care. Ring *et al* (2015) interviewed 18 different HCPs from 9 different practices and 11 adult patients ; purposively sampling from both affluent and deprived areas. Rashidian *et al* (2008) used a similar approach of the semi-structured interview but only approached GPs, specifically exploring organizational characteristics impeding or promoting guideline use.

Patient Records

Other studies within the scope of this review have attempted to quantify the use of asthma guidelines by HCPs by assessing patient notes. This includes looking at consultation records and auditing if clinicians had gathered [*recorded*] guideline related information e.g. frequency of asthma symptoms. Whilst this approach removes the bias introduced by the survey method and instead gathered real time information about actual behaviour, it relied on the assumption

that if a clinician asks a question, they will have the capacity and capability to document it clearly in the notes, and vice versa. This process clearly favours clinicians who make explicit documentation of their activities and conversely disadvantages those who do conduct guideline related activities, but who lack the time or resources for clear documentation, or those writing ambiguous notes.

Yawn *et al* (2008) took this approach – auditing the notes of 840 asthmatic patients from 24 primary care practices in the USA, in order to collect data about clinician behaviour in relation to symptoms, triggers, patient adherence and patient response to medical therapy. Quantitative data was supplemented by qualitative data from 14 distinct focus groups, including a total of 72 staff members and 71 patients and parents, which took place after an intervention tool was implemented. There is not a detailed description of the thematic analysis process, but the output of these focus groups identified key themes which are discussed below.

Similarly, Baker *et al* (2003), Mold *et al* (2014) and Eccles *et al* (2002) all looked at patient records to evaluate guideline adherence. Baker *et al* (2003) supplemented their review of patient records in 81 GP practices in England by sending out patient questionnaires, asking whether guideline recommendations had been conducted e.g. medication reviews. The authors considered a clinician to be demonstrating guideline adherence if either the patient, the notes or both suggested that a given activity had been carried out. Similarly, Homer *et al* (2005) made telephone calls to establish use of inhaled steroids, as reported by patients. Mold *et al* (2014) chose to monitor records 9 months before and 18 months after an intervention into asthma related visits in primary care, assessing if 6 key components of the guidelines were documented to have occurred. Eccles *et al* (2002) manually extracted data relating to guideline adherent activities from patient records, they also supplemented this with the electronic extraction of prescribing activities and patient reported outcomes collected by postal questionnaire to patients. These mixed-methods assessments of clinician behaviour appear to give a more complete and accurate representation of true activities in that locality but cannot be generalized across a wider geography or context. Lozano *et al* (2004) focused on the frequency of prescription of particular asthma drugs before and after an intervention, but this gave little context to the consultation during which they were prescribed and relies on a lot of assumptions about prescribing behaviour.

Wiener-Ogilvie *et al* (2007) conducted a comprehensive and multi-faceted effort to analyse asthma guideline use in England. They employed a recognized audit tool previously piloted by the UK General Practice Airways Group to assess the records of all adults with asthma diagnosed within the preceding 12 months. They sampled GP practices across a wide geographic area in the North East of England – although from the 1067 practices in the area, only 31 completed the asthma guideline arm of the study. 742 practices were excluded on the basis that they were single handed (i.e. run by one GP) or their computer system was considered “ineligible”. It is not clear what constituted an ineligible computer system, but this not only limits the generalizability of the study results but of the study format too, given that such a significant majority of potential practices couldn’t participate. The exclusion of single-handed GP practices disproportionately eliminates rural GPs practices. Wiener-Ogilvie *et al* (2007) assessed the consistency of documentation of three separate BTS/SIGN guideline recommendations pertaining to: objective diagnosis, pharmacological management and asthma action plan provision. For the latter, patients were also contacted and asked to complete a questionnaire about their action plan. Beyond this the group surveyed clinicians about the three recommendations and whether they felt that organizational change could improve implementation. The response rate was 77% among GPs and 72% among nurses. Documented adherence to the three recommendations ranged from 52% - 85.5%. This study also looked at the proportion of practices offering nurse-led structured asthma care and the training these staff had received – 87% of responding practices did offer a nurse led service and of these nurses 85% had a diploma in asthma care.

Question 3: What interventions have been tested to improve clinician adherence to guidelines?

Multiple authors have devised interventions directed at effecting change at the individual, organizational and system level in order to try and improve adherence to asthma guidelines. Table 3 (below) includes a list of major interventions appearing in the literature of this scoping review.

Medical Education

Continuing medical education (CME) interventions have applied different styles of learning including problem-based learning, didactic seminars and workshops. These have been variably supported by written resources and long-distance support after face-to-face sessions.

White *et al* (2004) compared the value of didactic seminars versus facilitated problem-based teaching for equal time lengths when updating 52 physicians on the Canadian Asthma Guidelines. The knowledge gain, knowledge retention and change in attitude was similar for both session formats, however the perceived educational value of the programme was higher in the problem-based learning group. No discussion is included as to whether this educational intervention directly affected the care process. Homer *et al* (2005) assessed outcome measures following three episodes of one-day learning sessions supported by educational materials, conference calls and an email list, but found that the education intervention *had no significant effect* on primary or secondary process or outcome measures for patients. By contrast, Renzi *et al* (2006) tallied the effect of a CME intervention against ED attendances and hospital admissions in Quebec, Canada. They found a statistically significant reduction in both, including 7.8% attending hospital in the test group compared to 13.5% in the control group. Kang *et al* (2010) identified that CME was physician’s preferred method of guideline dissemination, but the predominantly male cohort included were actually recruited from CME sessions.

Table 3

<u>Intervention</u>	<u>Format</u>
Continuing medical education for clinicians	<ul style="list-style-type: none"> • Didactic seminars • Workshops • e-learning • Academic detailing
Peer led interventions	<ul style="list-style-type: none"> • Asthma Research Group
Decision support tools	<ul style="list-style-type: none"> • Web based information • Prompting software • Checklists • Paper stamp tool
Performance feedback	<ul style="list-style-type: none"> • Audit results
Multi-Level change intervention	<ul style="list-style-type: none"> • Local learning collaboratives • Self-management educators • Planned asthma care (PAC) intervention

Table 3: Research Interventions to Improve Adherence to Guideline. This table summaries the scoping review findings, looking at the major strategies used by researchers to modify clinician behaviour with the aim of improving guideline adherence. The left column describes the broad approach strategies whereas the right column provides discrete examples of interventions within each of these five groups.

Watkins *et al* (2016) conducted a case-controlled study seeking to improve the compliance of community pharmacy assistants with Australian National Asthma Guidelines using academic detailing and workshops, supported resources including a checklist, videos and a web page. The two groups of pharmacies (n=30) were geographically separated by a river, to reduce potential “cross-contamination” or spill over of practice change. This intervention resulted in demonstrable improvement in the proportion of staff undertaking of guideline related tasks: giving information about the duration and frequency of asthma medication use; and increasing the frequency of appropriately referral to a medical professional from 32% to 47%. Watkins *et al* (2016) found academic detailing was an achievable on a large scale but did not facilitate team support and relied on internal communication between staff to disseminate information and promote practice change.

Peer Leadership and Collaboration

Lozano *et al* (2004) conducted a cluster-randomised controlled trial with two years follow up to measure the effect of a peer leader education (PLE) programme and a planned asthma care (PAC) intervention on the number of symptomatic days and the use of medication by asthmatic children. Patients registered at 42 GP practices in Seattle, Chicago and east Massachusetts were involved. The intervention was compared to usual care, which required practices to have received written copies of NAEPP guidelines.

The PLE programme was structured so that one physician from each practice was chosen as an ‘asthma champion’ and received formal teaching based on the NAEPP guidelines, on topics such as asthma drug treatment and physician behaviour change strategies. The teaching took place in two workshops over one calendar day and then the peer leaders formed a network to allow for local and national teleconferencing to continue after the initial teaching day. Clinicians received academic detailing sheets whilst at the workshops. These academic detailing documents related to prescribing, trigger control and specialty referral. The asthma champion was charged with sharing guidelines and motivating colleagues for the subsequent study period.

The PAC intervention devised by the same group for the same study was more intensive and patient centric and was carried out *alongside* the PLE programme for a sub-group of practices.

The PAC intervention involved training of asthma nurses who then arranged by 4 – 5 consultations with each patient. Nurses received telephone support for the two-year study period. Children allocated to practices in the PLE *plus* PAC intervention had a greater reduction in the number of symptomatic asthma days, compared to children in the PLE only cohort and those receiving usual care. The average number of hospital days and ED visits did not differ between groups. During the study period a decrease in asthma symptom days was observed in the usual care group– it is unclear if this was the result of a spill-over effect onto neighbouring practices enrolled in the usual care arm or another phenomenon. Regardless, decreasing the burden of asthma upon paediatric patients is a good outcome for patients and for the wider health and social care system.

The published work of Sullivan *et al* (2005) is the cost-effectiveness analysis of this PLE and PAC intervention work by Lozano *et al* (2004). The PLE and PAC interventions were costed in terms of their financial requirements, based on intention to treat principles. Results were that practices with PLE and PAC interventions spent *four times more per patient than usual care*. When the cost of the treatment and the intervention were combined –the annual cost per patient for the PLE plus PAC intervention was \$1292 dollars, versus \$504 for the PLE intervention alone and \$385 for usual care. Figures remained similar even when development costs were excluded from the analyses. Coupling the difference in cost with the difference in effectiveness resulted in an incremental cost-effectiveness ratio of \$18 per symptom free day for the PLE intervention and \$68 for the PLE plus PAC intervention.

Mold *et al* (2014) conducted a randomized controlled trial exploring interventions which encouraged collaboration between geographically close primary care centres in the US. All practices involved received direct support from a clinician who supported local clinicians to develop improvement plans in relation to asthma guidelines and gave performance feedback. Thereafter there were two further interventions: the first was involved a visiting practice facilitator to attending alternate weeks to assist practices in meeting guideline goals. The second intervention was the formation of Local Learning Collaboratives (LLC) whereby three centres joined together for monthly meetings of 1-hour duration to discuss performance in relation to NAEPP and NHLBI asthma guidelines. Unsurprisingly there was an overall significant increase in the implementation of six guideline recommendations for the study population who attended during this time. The average cohort was 25 patients per practice and

the cost for this 6-month intervention was estimated to be between \$7500 and \$15000 per practice.

System Level Interventions

The largest and arguably the most successful intervention unearthed by the scoping review process was that conducted by the Finnish Lung Health Association between 1994 and 2004 (Haahtela *et al.*, 2006). For more than a decade, there was a nationwide asthma strategy overhaul which resulted in a 90% of chief physicians reporting a change in their asthma practice. More importantly, there was a reduction in deaths due to asthma, a relative reduction of 69% in hospitalisations due to asthma and a 36% cost reduction per patient. The intervention comprised of sequential steps of educational interventions directed initially at dedicated lung and paediatric units, then at primary and secondary care professionals and they to the wider healthcare professional system. Educational interventions lasted one half-day only. In addition, local and regional networks of local asthma co-ordinators were established, with one physician and at least one nurse from each healthcare centre. In addition, patient organisations were recruited on board to help with patient education and distribution of information.

The Easy Breathing Programme was an intervention devised by Cloutier *et al* (2004) to attempt to improve adherence to NAEPP guidelines in the US. Its success was measured according to medication use by paediatric asthma patients in a before/after trial, but was limited to a low-income, urban and ethnic-minority population. The program involved a prescriptive four step progress – parents complete a validated questionnaire, to which the clinician determined the presence/absence of asthma, and from then the physician chose from a range of therapies using a guide and its associated an asthma treatment plan, which was then given in written format to the patient's parent. The use of the Easy Breathing Programme was facilitated by the training of 151 physicians, nurses, physician associates and medicine students over a four-year basis and repeated annually. There was a 2-hour visit each week from a paediatric asthma specialist who provided on-site consultation and diagnostic feedback to the clinicians for 2 hours each week. The implementation of this process improved adherence to the drug domain of the NAEPP guidance's from 36% to 98% during the study period. The intervention also produced sustained and tangible changes for all age groups and ethnicities and reductions in ED visits by 27% ($P < 0.01$), hospitalisations due to asthma by 35% ($p < 0.06$) and a 19% reduction in

outpatient visits ($p < 0.001$). In the children with asthma not enrolled in the cohort the hospitalization rate remained static for the study duration.

Later, Licskai *et al* (2012) performed a not dissimilar intervention project over a two-year period in Windsor Essex Country, Canada. This included a community-based infrastructure called the ‘Asthma Research Group’ which was registered as a not-for-profit organisation, led by a full-time project coordinator with input from community organisations including professional associations, hospitals and the local university. They devised electronic infrastructure on the form of two web-based forums which allowed for the scheduling of asthma care days and meetings. These asthma care days were for patients from across the region and involved an appointment with a trained self-management educator, immediately followed by a physician review, followed by a 30-minute follow-up within the subsequent 3 months. Prior to this study was only one individual carrying out asthma self-management education one day a week in the locality and the intervention equated to a 10-fold increase in staff capacity in this area. This project was evaluated according to self-reported patient outcome measures at baseline and at a mean interval of 22 months. There was statistically significant reduction in hospital attendances following this study.

Decision support tools and technology

There have been sporadic attempts by authors to use decision support aids and technological tools to improve adherence to asthma guidelines. For example, in addition to the CME programme, Renzi *et al* (2006) trialled providing primary care physicians with a self-inking paper-stamp checklist of guideline activities. Even in the group where the only intervention was the stamp, there *was* a significant improvement in physician knowledge (60%) of the key clinical practice guidelines and a trend towards reducing ED visits and hospitalizations for patients. This was bolstered with verbal encouragement and an incentivized by patient note audit.

Baker *et al* (2003) assessed the effect of presenting guidelines to GPs in England in three formats : as written, in a condensed review format or in a condensed review format but with performance feedback too. The review criteria sheet was essentially a single sheet for clinicians to fill in which containing a condensed version of the guideline. Neither the addition

of feedback nor the presentation of guidelines in a prioritized format improved the implementation of the guidelines.

Older work, for example that by Shiffman *et al* (1999), trialled technological interventions to improve guideline adherence, but years before computer usage was a fundamental component of healthcare delivery. At the start of their study, only 7/9 of the physicians described themselves as computer users. Their intervention involved giving HCPs up to 45 minutes of training and access to a 14-page manual on its use for an *AsthMonitor* (Yale & Apple). This new hardware with novel software required that primary care paediatricians completed a series of history and examination questions during their consultation and were then automatically presented with a guideline-based recommendation for that patient. Participants completed a further questionnaire after the study, evaluating their experience of using the technology product using a mixed selection of dichotomous yes/no answers, Likert scale questions and blank space answers. Answers were accorded a score of -1, 0 or 1 to provide what the authors refer to as a “global satisfaction index”. Of the 9 participants in the study, only 6 of the physicians actually used the system to recruit the required number of patients. These physicians cited concerns such as “*never becoming comfortable with the AsthMonitor*”. There was positive feedback to regard to check listing of guideline factors contained within the Newton software, however. 5/9 reported it was “*straightforward*” but 4/9 said they thought it was “*confusing*”. Eccles *et al* (2002) also tried a computer based clinical decision support tool, but it did not improve adherence to asthma guidelines by the doctors studied. Rashidian *et al* (2008) also found that computerised decision support tools were perceived to be *less useful* for chronic diseases and at times intrusive.

More recently, Rousseau *et al* (2003) describe an intervention whereby two suppliers of computer-based decision support tools integrated primary care management of asthma into their products – attempting to anticipate clinicians’ requirements and triggering an electronic guideline which offered suggestions for management and requested data entry for electronic recording. Two staff from each practice attended a one-day training workshop and collected supply materials, including a summarised version of asthma guidelines for staff in the practice. Unfortunately, the decision support software prevented normal use of patient data software. The system was perceived to be difficult to navigate and the training day resulted in “*slight confusion*” for one attendee and was too far away from another practice for the clinician to

attend. Furthermore, one GP reported that the “*reminder system is irritating*” and others that “*this software is driving me mad*” and “*obstructive to the consultation process*”. Clinicians mentioned that on-demand information sources such as colleague advice and traditional sources of information were enjoyable tools to use, were trusted and were giving them information in a volume and style that they found helpful.

More recently, an intervention using computer generated reminder system was designed by Kaferle and Wimsatt (2011). It prompted clinicians to write asthma action plans (AAPs) when the patient was in front of them. This intervention was introduced by way of a 15-minute introduction to the asthma action plans and a 2-hour face-to-face educational programme to registered nurses and resident doctors. The technology generated lists of asthmatic patients and nurses arranged to meet each patient for up to an hour. This was tested across 5 clinics and use of AAPs increased from around 14% in 2007 to nearly 50% in 2009.

As part of a mixed-methods study, Yawn *et al* (2008) developed an algorithm which was implemented across 24 primary care practises in Minnesota, USA and designed as a practice change stimulus. Each time a patient attended for an asthma review, they or their parents were provided by the clinician with a survey sheet containing questions on their asthma in the preceding two weeks, and all components of the NHLBI 2007 asthma guidelines. There were five components covering patient Activities, symptom Persistence, triGGers, Medications and Response to mediations (APGAR). A score was calculated and clinicians were then directed by the score to written clinical instructions presented in a flow diagram on the same sheet. Pre and post intervention data relating to the introduction of APGAR tool showed a significant improvement in documentation of symptoms as recommended, but also resulted in a significant increase in the prescription of preventative inhaled medications to patients and in the delivery of inhaler technique education. 22% of physicians at participating practices refused to use the APGAR system initially, but a majority of these reported that after hearing positive feedback from colleagues they would be willing to try it. For the most part however, HCPs included in focus groups after the intervention reported that this tool promoted the capturing of preliminary data, streamlined patient visits and improved the quality of the visit (Yawn *et al.*, 2008). Administration staff were included in the focus groups had also noticed that patients were requesting for “*that asthma sheet*” which suggests engagement from other stakeholders in this intervention.

Question 4: What factors have been identified as influencing adherence to asthma guidelines?

The scoping review process gathered information from multiple research methods looking into *why* clinicians are not following asthma guidelines at individual, organizational and system-wide level. These findings are summarized in table 4 but discussion is split into these three categories for clarity.

Table 4

	<u>Factor</u>	<u>Author</u>
Individual Factors	Knowledge of guideline	<i>Dombowski (2010), De Bruin (2018), Gagne & Boulet (2018)</i>
	Perceived usefulness of guideline content	<i>Wiener-Ogilvie '07/'08, Rousseau (2003), Rashidian</i>
	Perceived credibility of guideline source.	<i>Ring (2015), Gagne & Bouley (2018)</i>
	Workload	<i>Almutawa (2014), Wiener-Ogilvie '08, Loughheed (2007)</i>
	Perceived normal behaviour	<i>De Bruin (2018)</i>
	Perceived ability to conduct activity	<i>De Bruin (2018), Cloutier (2012), Tennen (2009)</i>
Organisational Factors	Hierarchy of staffing	<i>Wiener-Ogilvie 2008</i>
	Use of nursing staff	
	Availability of key equipment	<i>Tumiel-Berhalter (2005), Ring (2015)</i>
System Factors	Regular Audit	<i>Watkins et al (2016), Rashidian et al (2008) Almutawa et al (2014).</i>
	Financial Incentives	

Table 4 : Factors Impacting Guideline Implementation Practice. In total we identified 11 types of factors that impacted guideline implementation practice. These could easily be divided into factors related to individuals (the top row), factors relating to organisations (middle row) and factors related to the wider healthcare system, beyond the control of a single organisation.

Individual Factors

In several examples authors demonstrated that a *lack of knowledge* about asthma diagnosis, monitoring and treatment was contributory to poor adherence to guidelines, with a 35% failing to recall the criteria for assessing adequacy of asthma control (Gagne & Boulet, 2018) and 65% of physicians were not comfortable interpreting spirometry results (Dombowski *et al.*,2010). Staff not using spirometry reported that it required excessive staff time, with inadequate staff

training and inadequate financial reimbursement. These attitudes were less evident among physicians using spirometry regularly. The same group found that clinicians did seek further training opportunities and therefore were motivated to improve compliance. Wiener-Ogilvie *et al* (2007) found that clinicians, especially nurses, identified that improving knowledge among healthcare staff, reviewing clinic procedures and improving communication could improve adherence to guidelines. Some GPs reported feeling deskilled in asthma management given the predominance of nurse led asthma care in their practice and this impacted their ability to deliver self-management advice to patients, for example ... “perhaps we leave things to the practice nurses too much...” (Wiener-Ogilvie *et al.*, 2007)

Other authors found that lack of compliance with guidelines was strongly influenced by the clinician’s perceptions of the *content* of the guidelines and their application to personal practice. Furthermore, there was evidence that the likelihood that a clinician would complete a guideline related activity was influenced by their personal perception about what was a *normal* behaviour and similarly of their own thoughts regarding their ability to carry out each task (De Bruin *et al.*, 2018) and their level of agency thinking (Tennen *et al.*, 2009). Self-efficacy was a characteristic identified by Cloutier *et al* (2012) as associated with greater level of involvement in asthma programme related activities but was not associated with a measurable improvement in patient outcomes, medication use or delivery of written asthma treatment plans.

Unfortunately, in several examples across the geographical map we see that the *burden of workload* was felt to be strongly contributory to clinician failure to comply with guideline recommendations (Wiener-Ogilvie *et al.*, 2008; Almutawa *et al.*, 2014; Gagne & Boulet, 2018). There was also a perceived burden associated with adjusting to the change of guidelines. In other examples, it seems that the burden of workload was felt to be misplaced on primary care clinicians - with GPs expecting that guideline developers themselves should be responsible for distributing information and for “*convincing*” GPs of their applicability and utility (Rashidian *et al.*, 2008). Among allied health professionals such as pharmacists, long work hours and seasonal fluctuations resulted in poor uptake of interventional staff education opportunities outside of working hours (Watkins *et al.*, 2016).

Several groups studied clinician opinion on the perceived *usefulness* of asthma guidelines and there was a very heterogenous mix of responses, with little concordance or trend evident between clinicians or different professional groups. Highly compliant GP practices reported greater agreement with and confidence in using asthma guidelines than their less compliant counterparts, who reported that scepticism and concern that gaps in the evidence that made them question the validity of the guidelines. In one study, 1/3 of clinicians reported that they didn't find the asthma clinical practice guideline recommendations useful in making a diagnosis and 45% reported that the guidelines weren't useful in addressing patient concerns. Many physicians disagreed with aspects of the guidelines e.g. need to refer to specialist, need for regular follow up appointments and example excerpts from GPs included "*guidelines cannot substitute for clinical judgement*", "*are not always necessary*" and "*didn't work for some people [patients]*" and this was supported by quantitative data (Wiener-Ogilvie *et al.*, 2007; Rousseau *et al.*, 2003; Rashidian *et al.*, 2008; Gagne & Boulet, 2018; Ring *et al.*, 2015) . Nevertheless Gagne and Boulet (2018) report that 98% of the physicians asked rated the guidelines as having at least some usefulness, and in other work clinical staff were more positive and cited that "*guidelines are good when you face difficult management problems*" and that asthma action plans were "*absolutely essential*". Kang *et al* (2010) surveyed Korean physicians, who reported that the guidelines perceived to be most useful were those relating to medication and classification of disease severity.

Another theme was the *credibility* of guideline source, which frequently related to the perception clinicians had towards the methods, persons and organisations behind asthma guidelines. Rashidian *et al* (2008) describe GPs often refused to ratify the guidelines if the underlying evidence didn't originate from a primary care or polymorbid populations. GPs also variably considered guideline producing bodies as "reputable" or otherwise, and perceived guidelines as being less credible if there was high representation of secondary care consultants in the developing body. These attitudinal barriers sometimes arose from a tension between primary and secondary care practitioners – whereby GPs felt that guidelines facilitated the offloading of work from secondary care to primary care. Nevertheless, secondary care consultants were considered influential determinants of guidelines use by GPs, and other influential individuals were considered to be practice managers, practice nurses and district nurses.

There were different responses from clinicians in how they perceived patients to interact with the written aspects of the guidelines, but one extract was that “*it goes straight in the bin*”. Professionals did recognise that there was a cohort of patients who would find value in personalised action plans but disagreed with the distribution of such a document at initial review because it was “*information overload*” for the patients. As such there was not much enthusiasm for action plans from professional and “*very rarely do patients bring them in*” (Ring *et al.*, 2015).

Organisational Characteristics

The delegation and distribution of the asthma workload in primary healthcare appears to vary significantly between organisations, eras and healthcare systems, even within a single country such as the UK. Gagne and Boulet (2018) identified from their cohort that 77% of physicians wanted the assistance of other healthcare professionals; and largely speaking asthma care is delivered collaboratively by nurses and doctors. The relationship between these professional groups is complex, but it is often described that doctors delegate duties to nurses, and this shift in distribution appears to be becoming more prevalent. The hierarchy (or lack thereof) between colleagues was considered to be an important determinant of compliance with asthma guidelines, with highly compliant practices demonstrating a flat hierarchy with free-flowing discussion, open channels of communication and support between clinicians. In one practice the doctor demonstrated trust and confidence in the nurse’s abilities (Wiener-Ogilvie *et al.*, 2008) and this was perceived to empower the nurse to be able to challenge and influence the GPs behaviour in return. This allowed for the organisation to find administrative support to help the nurse deliver consistent care. In practices where communication was rigid i.e. nurses could only ask questions of GPs at a given time of the day, the trend of compliance was lower.

Limited availability of equipment for clinicians (e.g. spirometers and peak flow meters) had a demonstrative effect on their conduct of guideline activities, but medical personnel didn’t universally consider these to be essential for asthma care (Tumiel-Berhalter & Hershey 2005; Gagne & Boulet, 2018). Tumiel-Berhalter & Hershey (2005) suggested that in many cases the physical equipment required to deliver guideline concordant asthma care is simply not present in some primary care establishments. It is not clear who is responsible for the allocation of

funds for equipment and nor is it clear if funding systems attribute any value to delivering guideline concordant care, despite the well documented clinical benefits are.

Whilst the use of technology to improve poorly concordant asthma service is discussed above, in some instances computerised devices were the rate limiting step (Ring *et al.*, 2015). Paper documents were also identified as problematic, for example clinicians identified that the letter sent to patients to arrange asthma review did not contain any information about their action plans or advise them to bring these documents to appointments. Furthermore, the formatting of such documents was mutually incompatible between practices and this prevented asthma information being transferred if patients moved or changed practices.

The more recent evidence presented by Rashidian *et al* (2008) suggests that the training status of a practice *did not* predict prescribing behaviour of its clinicians and furthermore the presence of a dedicated “asthma clinic” within a practice was actually correlated with less concordant asthma prescribing. This work also identified that there was a perceived lack of organisational support for guideline implementation. The use of audit as a monitoring tool by organisations was felt to facilitate implementation by informing GPs of their real-life performance; the regular distribution of audit results was also felt to be encouraging whereby GPs did not want to be perceived as failing in front of their peers.

System characteristics

Few of the studies really explored wider system level characteristics which impacted asthma guideline adherence. However when Watkins *et al* (2016), Rashidian *et al* (2008) and Almutawa *et al* (2014) asked clinicians what their perceptions were of barriers to adherence, individuals reported that inadequate financial incentives, lack of a follow up system and lack of access of staff to training opportunities preventing them from delivering care. These factors are frequently determined by regional or national bodies and their impact is upstream of the organisational and individual factors discussed above.

CONCLUSION

The scoping review process has explored and identified that failure of healthcare organisations to deliver guideline recommended asthma care in the primary care setting is multifactorial.

Furthermore, this is an issue which affects a huge number of healthcare systems : Scandinavia to Kuwait, America to Australia and is certainly not just a UK based problem. A substantial proportion of the research has been conducted in the privately funded American healthcare system and it is unclear how transferrable this evidence to the UK NHS particularly in more rural areas. Implementation improvement endeavours must adapt to a local context.

Nevertheless despite 25 years of research there is no conclusive explanation for why clinicians do not use guidelines which are designed to help them and help their patients. It does appear that if we desire more guideline concordant care, then enacting system level change and incorporating nursing and the allied healthcare professionals is good place to start. Interventions to improve adherence to asthma guidelines do provide tangible improvements in healthcare outcomes for patients, at least in the short term. The translation of primary research findings to high-quality, easily-accessibly summaries for the busy clinician inevitability involves the widespread use of technology and computer-based decision support systems. Testing health technology in real world settings prior to mass dissemination often forms a component of guideline implementation and should continue to do so (Mellis *et al.*, 2014).

Many tools have been applied to the monitoring and improvement of asthma care with variable success. It should be recognised that future work should continue to explore system, practice and individual healthcare professional determinants of care behaviours to allow targeted interventions. The largest improvements have been where well organised, adequately funded, patient-centric, multi-level intervention have persisted for extended periods of time and exerted real behaviour change effects.

Chapter 3

Part A : Research Methods

BACKGROUND

Betsi Cadwaladr University Health Board (BCUHB) is one of 9 health boards in NHS Wales and has a resident population of approximately 694,000 people, living across an area covering 2,500 square miles (Public Health Wales 2018). The health board is divided into 14 primary care clusters, with each cluster area caring for between 30000 and 50000 individuals (www.primarycareone.wales.nhs.uk/primary-care-clusters). The prevalence of asthma in Wales is reported to be one of the highest in the world and admissions to hospital for asthma in Wales are higher than the rest of the UK (Health in Wales 2019). The earliest available local mortality data available is from 2001, when 16 people died from asthma in BCUHB in one year alone (Office for National Statistics 2016). Data from 2015 showed that the reported number of asthma deaths was static at 16, but there was population rise during this time. Clearly mortality figures are highly concerning, but so is the morbidity for children and adults living with either undiagnosed, inappropriately diagnosed, over-treated or poorly controlled asthma.

The Royal College of Physicians (UK) 2014 national review into asthma deaths (NRAD) report “*Why Asthma Still Kills*” cited that poor implementation of asthma guidelines by healthcare professionals nationally contributed to 46% of potentially avoidable asthma deaths in the UK in the preceding year. In addition, the report finds that 59% of asthma deaths across all age groups were considered to be associated with lack of adherence to guidelines by *primary care* clinicians in the 12 months prior to the patient death. This worrying statistic calls into question the handling of patient cases, yet the report makes little attempt to *explore* the roles of clinician, organisational and system level factors which lead to those patients not receiving guideline appropriate care; or to *explain* why guideline statements are not percolating through to generate tangible practice change amongst front line clinicians. The Government's health and social care legislation is clear that the primary purpose of the NHS is to improve the outcomes of healthcare for all. Using multiple case study design (Yin., 2014) this study seeks to explore the determinants of current practice in asthma diagnosis amongst health care professionals in two

neighbouring localities, to provide a rich and detailed account of the barriers and enablers which influence use of guidelines by these clinicians.

AIMS and OBJECTIVES

This study seeks to explore the barriers and enablers to the implementation of NICE (2017) and BTS/SIGN (2016) guidelines on the diagnosis of asthma, centred on healthcare professionals working in two primary care clusters within a local health board as case studies A and B. In this way the objectives of the study are:

1. To examine current use of two major national asthma diagnostic guidelines within primary care in BCUHB in two purposively sampled case study areas (A) and (B);
2. To identify and explain how current asthma diagnosis is understood and operationalised by the professionals involved and by the wider system in which they work;
3. To understand the barriers and enablers to guideline implementation;
4. To provide recommendations for future development of practice to supporting the implementation of asthma guidelines.

METHODS

The NHS is an enormous and complex system; primary care is a complex sub-system embedded within this and is enacted variably within different localities. Multiple case study design (Yin., 2014) is a qualitative research approach well suited to this area; it can be applied to explore complex social phenomenon, gain in depth understanding of real life rather than an experimental setting and can be both exploratory and explanatory in use. There are several different broad categories of case study which include ‘single-case study’, ‘multiple case study’ and ‘embedded’ case studies which helpfully provide clarity for study design. Regardless of overall structure, all cases are fundamentally embedded in their respective contexts. A single-case study is helpful in understanding unique, extreme or critical cases; multiple-case study allows comparison within and across settings; facilitating a logical connection between the data collected to the research questions and theoretical propositions. Each chosen case must be bounded and a rigorous case study includes propositions and the application of conceptual frameworks. (Yin., 2003). It enables the researcher to answer “how” and “why” type questions,

while taking into consideration how a phenomenon is influenced by the context within which it is situated (Baxter & Jack., 2008). For the novice researcher, case study provides an excellent opportunity to gain tremendous insight into a case (Baxter & Jack., 2008) . It enables the researcher to gather data from a variety of sources and to converge the data to illuminate the case.

Multiple case study design (Yin., 2014; Stake., 1995) is based on constructivist philosophical theories and is more suited in this context than *single* case study design (Yin, 2009). By comparison to Stake (1995), Yin (2014) provides a range of different approaches for researchers to use, including an exploratory for hypothesis development and an explanatory for process analysis. Case study is practically versatile, pragmatic, flexible and particularly useful when contextual conditions are plausibly pertinent to a phenomenon, e.g. the use of clinical guidelines. Overall, the evidence created from this type of study is considered robust and reliable, but it can also be time consuming and expensive to conduct. Case study can be used to focus on *particular* rather than *general* units of analysis to generate rich data which allows the researcher to gain a holistic view based on multiple sources of data. Furthermore, case study provides an opportunity to map complex interrelationships between components of an individual case e.g. social, political and technical contexts. Plsek and Greenhalgh (2001) proposed complexity theory for consideration in health care implementation research. Complexity theory argues against the reductionist standpoint that all problems in healthcare can be solved, instead placing acceptance and value upon the inherent tension between opposing parts of the system (Plsek & Greenhalgh., 2001). This recognizes that changeable elements, non-linear relationships and emergent behaviour lead to an inherently unpredictable pattern, and so the best way to *know* even a small part of the NHS is by observing it and by finding out how the people who exist in that system experience it (Lorenz., 1993). Subsequent development of Rogers' Diffusion of Innovations theory by the same group has had widespread success in the evaluation of guideline implementation (Rogers., 2003; Greenhalgh *et al.*, 2005)

This study was preceded by a scoping review which sought to explore the existing body of literature relating to theory, study methodology and practice of clinicians providing care to asthmatic patients in the community. The results of that scoping review are presented elsewhere. Additionally, time was spent gaining familiarity with the wider implementation science literature, which allowed for the identification of existing frameworks, such as those

which proposed *determinants* of guideline use. For example, Procter *et al* (2011) developed a framework which proposed eight determinants : acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration and sustainability. Collectively this preparatory phase generated propositions (Baxter & Jack., 2008) which are an important component of the Yin (2014) approach to case study design. Formative theoretical propositions are useful in case study work to shape data collection and analysis, guided by the researcher based on the research question and the phenomenon (Yin, 2014; Stake 1989). Propositions increase the likelihood that a researcher can carefully bound the extent of the study, therefore increasing feasibility.

Robust case study research requires credibility, trustworthiness, confirmability and dependability (Yin., 2014; Baxter & Jack., 2008). These are linked to study design, data collection and to data analysis processes. Case study data analysis can be as diverse as the data collection techniques but requires interpretation of meaning by the researcher by accepted methods. Researcher reflexivity is essential to avoid bias and ensure a record of cases and conclusions (Yin, 2014). Establishing a theoretical context as a framework for a case study facilitates more in-depth exploration of a given case but it also allows greater degrees of transferability and generalisability (Yin., 2014).

Social Networks

There have been multiple iterations of asthma guidelines in the UK and it is reasonable to assume that the wording and content of national asthma guidelines will continue to evolve as new evidence accumulates; indeed, the next draft of BTS/SIGN guidelines for 2019 have already been made available at - www.brit-thoracic.org.uk/quality-improvement/guidelines/asthma/. It therefore was a pragmatic choice to ensure the study explored *system level factors* which will likely endure through multiple iterations of the NICE and BTS/SIGN guidelines. A system characteristic is one that would persist even when the individuals involved change or the exact nature of the guideline varies. Human factors is the study and practice of the relationship between humans and systems (Catchpole & McCulloch., 2010). In their paper Catchpole and McCulloch (2010) highlight the increasing recognition in the healthcare literature of the need to consider the complex relationships between human behaviour and technology, tasks, environment and organization. In recognising the social nature of healthcare, researchers in this study moved to consider social networks and boundary

objects as concepts which could help explain the operationalisation of guidelines within the cases

“Social networks are the empirical phenomena of interconnected patterns of relations” (Bellotti., 2015 p.5) involving individual or groups of actors or organisations. Social networks tend to be investigated through techniques embedded in *network analysis*. These analyses align with network science, which is focused on exploring ‘dependencies’ and ‘associations’ amongst networks. Collectively these interactions form a relational texture from which meaning emerges (Bellotti., 2015). This texture comprises symbolic, cultural, social and spatial aspects; these interlock and represent a dynamic field of action and interaction among actors and organisations in the social world (Bellotti., 2015)

In the context of the study, network science provides a useful lens for interpreting the implementation of asthma guidelines within a primary care environment, although not in a comprehensive way. Bellotti (2015) highlights the utility of applying network science through *qualitative* work as part of social network analysis in order to understand the relatedness of associations which exist, which can occur as a preamble to more formal mapping and systemised representation through *quantitative* social network analysis. Nonetheless, the concepts of ‘nodes’ relating to the focus of analysis such as actors in a network and ‘relations’ centred on the connection between nodes and ‘ties’ that bind them, remain important. Furthermore, the basic components of ‘ego’ and ‘alters’ are relevant as part of the description in mapping networks and how they function within the study. The term ‘ego’ refers to key individuals mapped within the social network, linked to asthma guideline implementation in primary care and how ‘ego’ relates to other people within the network, defined as ‘alters’.

Overall, the study utilises network science to enhance the detailed explanatory case studies (Yin., 2014) by focusing analysis on the discrete nature of primary care teams and how they relate to different parts of the network and are tied with the secondary care sector. As Bellotti (2015) argues, detailed qualitative-based network analysis has a useful contribution to make:

“The flexibility and thick description of qualitative methods can illustrate the relational work that actors in networks engage with in defining identities, interactions and network structures, in negotiating cultural conventions and in exchanging symbolic and material resources” (Bellotti., 2015 p3).

Sampling and Recruitment

We used a purposive sampling technique (Yin., 2014) of individual health-care professionals working in the primary healthcare sector. **A ‘purposive sample’**, also referred to as a *judgmental or expert sample*, is a type of nonprobability sample. The main objective of a purposive sample is to produce a sample that can be logically assumed to be representative of the population (SAGE., 2008). We planned purposive samples from two pre-identified GP-cluster areas of BCUHB – case area A and case area B. All individuals targeted were directly involved in the delivery of asthma care and some were also involved in service design as part of their job plan. Key stakeholders were identified from pilot discussion with personnel familiar with the structure of asthma care in the health board. The major groups of clinicians were general practitioners, nurse practitioners and practice nurses.

Case A covered a region with a total of 6 GP surgeries and case B included 8. The patient populations were around 40000 per case. Case B is considered to be more rural than case A, the latter covering several large towns areas. The prevalence of asthma in the Case A cluster was higher at 6.4% compared to the case B area at 5.9% (Public Health Wales 2018).

Ethical approval for this study was obtained prior to data collection from BCUHB research and development department, Bangor University and Health and Social Care Research Wales.

Participants were invited to become involved in the study through email invitations which were sent to all GP practices and identified clinical staff in case A B areas. Subsequent emails were sent to further offer participation. At the end of recruitment, 10 clinicians had responded to email invitations and of these 9 participants were recruited for semi-structured interview – 5 from case A cluster [1 doctor, 4 nurses] and 4 from case B [3 doctors, 1 nurse] . The 10th individual did not respond to subsequent emails to arrange interview. One practice in case B cluster responded that they had decided to not participate in the study collectively due to being involved in other research studies. Participation was supported by a written consent following reading of a participant information sheet outlining the purpose and components of this research. All involvement was voluntary and participants were free to withdraw from the study at any time without providing any reason. No monetary expenses were recompensed to participants or other individuals during the study. Data collection were conducted at a time and place convenient to the participant so as to not cause any disruption to planned patient care. Interviews lasted between 25 minutes to 45 minutes in total.

Data Analysis

A theoretically driven inductive thematic analysis was used to analyse the data. There were 6 major phases of this analytical process: (1) familiarisation with data (2) generation of initial codes (3) searching for themes (4) reviewing themes (5) defining and naming themes and (6) producing the report, similar to the format described by Braun and Clarke (2006).

A coding frame was established by reading and re-reading transcripts and realised using Microsoft Excel 2019©. Initial codes were generated from the first 4 transcripts. Transcript and field note analysis then continued until saturation was reached, that is, when no new information was being generated from the analyses. From the coded transcripts the researcher (FH) developed groups of codes and eventually sub-themes. Initial sub-themes were visually developed using iterative diagrams. Ongoing thematic development led to the generation of key themes. Specific transcript extracts were identified where they provided clear examples for the coding frame (Appendix 1).

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Part B : Results

Abstract

Background Clinical guidelines for asthma are available to UK clinicians but implementation is not straightforward. Diagnostic and treatment inadequacy contribute to patient morbidity and mortality and lack of adherence to guidelines is a component of this. **Objectives** This qualitative study sought to explore and understand the use of asthma guidelines by primary care clinicians in two geographically bounded regions of Wales. **Methods** Multiple case study design (Yin., 2014) was used. Data was collected using semi-structured interviews with a purposively sampled group of clinical staff from GP practices. Interview transcripts were thematically analysed to produce a detailed picture of practice. **Results** Asthma care in the studied areas operated as a social network of clinicians who often used guidelines as boundary objects. Practice and local service design was influenced and dependent upon regular input

from local secondary care providers. Clinicians looked to British Thoracic Society and Scottish Intercollegiate Guideline Network (BTS/SIGN) 2016 guidelines. There was limited use of National Institute for Health and Care Excellence (NICE) 2017 guidelines. Barriers to guideline recommended diagnostic asthma care included: lack of acceptability, financial costs and disempowerment of nursing staff. **Conclusion** The findings from this study replicate and reinforce the findings of previous work, specifically that by Wiener-Ogilvie (2007) and Wiener-Ogilvie (2008). It is striking and concerning that the thematic outcomes of this study bear a strong resemblance to that which was demonstrated over a decade ago. The guideline-implementation gap in asthma diagnostics will persist unless there is significant restructuring, financial investment and empowerment of nursing staff in primary care.

THEMES

Thematic analysis of the two case studies generated six major themes. Collectively these made headway in answering the proposed research questions. Asthma guideline operationalisation was remarkably similar in both case studies and almost entirely based around BTS/SIGN usage, to the exclusion of the NICE guideline. Financial concerns were widespread and there was a concerning level of disempowerment amongst practice nursing staff. Practice was influenced by secondary care to an unexpected degree; this was positively perceived but contributed as an unconscious determinant of behaviour across the system. The themes are discussed below as follows:

- I. Manifest positivity, latent caution
- II. Fixation on FENO
- III. Disempowerment
- IV. Gate Keepers
- V. The Social Network
- VI. Boundary objects and Brokers
- VII. Apathy towards change

Theme I: Manifest positivity, latent caution.

All clinicians interviewed as part of the study described awareness of and access to published national asthma guidelines. In addition, there was regular reported use of locally adapted guidelines that the research team were not aware of prior to the commencement of this study.

The local guidelines available to staff had been generated by secondary care clinician and were used predominantly to help with decision making regarding medication choice for asthmatic patients. The versions of these local guidelines in use varied, the oldest dating from 2012. Manifestly there was a strongly positive sentiment towards asthma guidelines, with staff initiating conversations around the value of guidelines as a foundation for clinical decision making and a tool which could offer reassurance and instruction.

I think they are very important, because we wouldn't have anything else if we didn't have them! ANP01

*You're going on a bit of a hunch, aren't you? That's kind of a bit of worry sometimes...
I like having guidelines to follow. PN02*

However, during interviews there were many barely concealed frustrations; not only regarding the existence of multiple guidelines offering conflicting advice, but towards perceived inadequacy of content because none of the guidelines could provide diagnostic certainty in all cases. In addition, actual use in daily practice, especially by GPs, was often minimal. Exploring this topic during the interview suggested this was often attributed to time constraints, with clinicians reporting that daily access was not realistic given ongoing limitations to their professional time.

The guidelines are freely available. Whether people have the headspace to look at it all the time might be a different matter. GP001

In practical terms, using guidelines meant something different to each clinician interviewed. Some staff reviewed printed copies attached to office notice boards or in ring-binder folders; others used pdf files on workstation desktops; and others accessed documents from source websites on an 'as required' basis. There were technical concerns related to using local health board trust computer systems to access local and national guidelines, particularly in identifying key or up-to-date documents without excessive searching. This concern was by no means universal and not a pervasive barrier amongst participants more generally.

None of the interviewed participants were knowingly following NICE (2017) guidelines, and all reported using BTS/SIGN (2016) in their current practice. The major perceived discrepancy between the two documents was the role of Fractional Exhaled Nitric Oxide (FENO) test, which is a key diagnostic step for primary care clinicians in the diagnostic algorithm set out by the NICE (2017) document. FENO testing is currently only performed in secondary care in the region and none of the GP practices had direct access to this testing modality without referral to secondary care. There didn't appear to be recognition or acknowledgment amongst participants that FENO is actually included within the BTS/SIGN (2016) document as an option for objective assessment in intermediate probability asthma.

There were expressions of guilt by participants around *not* using NICE (2017) asthma recommendations, but these were infrequent, and where they did occur were immediately dismissed by clinical safety, cost concerns or perceived irrelevance of the NICE (2017) guidelines compared to the BTS/SIGN (2016) recommendations. For example, the perception that initiating a course of inhaled corticosteroids when there was diagnostic suspicion was the 'safer option', at least in the short term.

NICE are always the one that you follow but, in this instance, because all of the other guidelines and because of the deaths with asthma, we've sort of gone along with using the ICS really [as required by BTS guideline]. It does feel as though it's something that we shouldn't be doing but when you've got all this other information [about asthma deaths]... we've gone with that. PN03

These concerns did not tend to be organically generated by staff reviewing the evidence base themselves, instead they arose anecdotally from case-studies discussed by educators at training courses. It was clear that external, often third-sector educators, had significant influence over practice.

Despite heterogeneity in reported training opportunities, reported patterns of clinical behaviour were remarkably similar across both clusters and all three clinician groups (advanced nurse practitioners, doctors and practice nurses), particularly in terms of the initial consultation process. All clinicians relied heavily on patient history, clinical examination and thereafter very often on spirometry. Patients were seen by nurses and doctors in a similar capacity in pre-

booked appointments or acute reviews, but many nurses reported self-referring patients with suspected asthma directly from minor illness clinics to their own focused asthma/COPD clinics at a later date. After initial clinical assessment, the next step for most clinicians was referring a patient for in-house spirometric testing, typically undertaken by either a member of the practice nursing team or by a health care assistant trained in the performance but not the interpretation of spirometry results. No other diagnostic tests were used consistently by interviewed participants, although peak flow was mentioned on multiple occasions as an option at this point, consistent with BTS/SIGN (2016) recommendations for objective testing to confirm variability. The interpretation of spirometry results followed no definite pattern in terms of role allocation either.

The interviewed practice nurses appeared to see significantly more cases of suspected asthma than the GPs yet relied on their GP colleagues to confirm that the plan they proposed was appropriate. There was an expectation by both GPs and advanced nurse practitioners to be competent in interpreting spirometry results and come up with a management plan independently without the support of GPs, but for practice nurses this was not the case. There was widespread evidence of an expectation for practice nurses to discuss every case prior to commencement of management.

What is do is my bit, it's the lung function, take the history... in my mind I think 'Yea, this is suspected asthma' so I get the script and I take it all to the doctor and say 'this is what I've done are you happy to sign a script?'. PN01

This pattern of behaviour was widespread in both case study areas. The interviewed GPs undertaken minimal asthma-specific training; by comparison the practice nurses all attended annual update courses. There was therefore a discrepancy between autonomy of decision making versus training in this specific area, with doctors occupying the traditional niche of diagnosticians despite delegating history taking, examination and prescribing to other staff.

Within some interviews there were inconsistencies about reported practice. For example, one participant in case B initially stated that they used the BTS/SIGN (2016) document, but on further enquiry explained that they felt having paper copies of the guideline was unrealistic and technical issues precluded their use of electronic versions i.e. they weren't accessing them. In

turn they then reported reliance on the British National Formulary (BNF) for guidance in asthma management but didn't typically use guidelines to help with diagnosis. A GP in case A opening with a statement that they were using BTS/SIGN (2016) but later describing clinical practice much more consistent with the NICE (2017) guidance. There was clearly confusion about which content could be attributed to each guideline, and this perhaps reflects the more widespread confusion about what is the most appropriate way to initiate management for patients with suspected asthma.

It's usually BTS for asthma. I usually give them a Ventolin® [salbutamol] inhaler and tell them to come back in a couple of weeks. GP03

Clinicians were largely aware of the existence of more than one guideline document but variably recognised the different diagnostic and management plans proposed by each. What was evident in a majority of interviews - amongst clinicians from both clusters - was uncertainty and confusion in relation to: dates of guideline publication; and the professional relationships of three major organisations

BTS/SIGN are part of NICE, aren't they? PN01

Simply being aware of a guideline did not correlate with description of use. Some clinicians were clearly very familiar with exact content of both major guidelines in terms of the diagnostic process for adults - as below - but this degree of comprehension was certainly not widespread and other clinicians were more simplistic in their approach. For the most part clinicians referred to the guideline document just as '*the BTS ones*', but the documents viewed by the interviewer were always the joint publication from BTS and SIGN.

There are the NICE guidelines, there are the BTS guidelines and they don't always agree on every aspect. It's just subtle differences really, peak flows are one of them. ANP01

The degree of 'penetration' (Procter et al. (2011) of the BTS/SIGN (2016) guidelines was clear - medical and nursing staff made clear, repeated reference to using BTS/SIGN (2016) guidance during discussions about patient consultations. Some participants also took the opportunity to

show the interviewer printed copies of this guidance during the interviews, which typically took place in staff consulting rooms. Several interviewed nursing staff reported that clinical guidance also came in the form of written information given to them at corporate sponsored respiratory training days. These training days were arranged locally on an annual basis and typically free of charge to attend. Time pressure factored into education; some GPs said they couldn't justify permitting nursing staff time to attend respiratory education and had themselves no access to funded training opportunities. For GPs, training was reportedly undertaken their own discretion and expense; there did not appear to be any expectation for formal certification, accreditation or revalidation process specifically relating to the care of asthmatic patients. It was clear that the wider primary healthcare system was perceived to be at high-capacity, and as a result education was a clear sacrificial option to try and save time.

Obviously medical school is quite a long time ago, so it's just a case of doing it for our own education [...] in GP we don't get any protected education time at all. GP04

Although this research study primarily intended to explore how clinicians used guidelines in the *diagnosis* of asthma, but it was clear from early interviews that guideline selection was intrinsically linked to guideline preference in terms of *management*. This is an 'accessibility' issue, as proposed by Procter *et al* (2011) as a component of implementation success, or failure in this case in relation to the NICE (2017) document. Both *diagnostic* and *management* advice are included within a single PDF document from BTS/SIGN (2016). The presentation of information is aesthetically different to the text-only webpage carrying the NICE (2017) information. It seems plausible that clinicians prefer both the content and the format of the BTS/SIGN (2016) guidelines compared to the NICE (2017) management document and take the path of least resistance by using the diagnostic criteria presented in the same document rather than looking elsewhere.

There wasn't complete acceptance of every aspect of the BTS/SIGN (2016) recommendations, although concerns were generally limited to the longer-term implications of managing all asthma with inhaled corticosteroids, rather than the diagnostic process itself. It was encouraging to find that staff members from both case study areas and both medical and nursing cohorts demonstrated that they were critically appraising the guidelines, placing primacy on patient outcomes.

I don't know what the effect of having a long-term ICS [inhaled corticosteroids] for 20 years when they never needed it... so that does worry me, especially younger patients” – PN02

The widest variety in diagnostic practice related to paediatric patients, and for each clinician there seemed to be a variable caseload for this category of patients. Although history and examination were again commonplace, there was variable use of diagnostic tests in terms of choice; perceived appropriateness; interpretation of results; and subsequent choice of management strategy. Clinicians who sought education and advice from local paediatric department were more similar to each other in their clinical questioning, diagnostic approach and referral patterns compared to clinicians who had not done so. It was clear that diagnosing and managing asthma in children was an area of uncertainty for many primary care staff – concerns related primarily to the safety of using inhaled corticosteroids and uncertainty about using diagnostic equipment. However, for some case it was a *lack of knowledge* which drove the uncertainty.

I'm not sure what the guidance is for younger kids, actually. GP01

Variation in practice across both clusters may well be reflective of the uncertainty in the wider literature about the natural history and management of asthma in children, but nonetheless is of concern given the high prevalence of asthma in children and adolescents. For clinicians looking after adult patients, there was consistent fixation upon performing objective spirometric testing – seemingly in every case and regardless of diagnostic probability after history and clinical examination. This was always an ‘in-house’ procedure, and there was a recurring theme of latent pride amongst staff that this test was something they could perform locally. Spirometry appeared to be performed for all adult patients, whether or not it was necessarily indicated by the BTS/SIGN (2016) guideline [the guideline doesn’t specify the need for spirometry where the history and examination process is highly suggestive and a validated symptom questionnaire would be sufficient]. This was not the case in children; some clinicians reported using spirometry for children as young as 7, other speculated that it wouldn’t be possible to perform the test for children under 10 and so didn’t incorporate this testing modality into their paediatric practice. There was also significant variation in perceived usefulness and application of serial domiciliary peak flow recording. One clinician questioned

the clinical usefulness of peak flow in paediatric population at all, while others made diagnoses *entirely based* on peak flow results, based on results from a few days. There was some scepticism about the performance and recording of these tests at home, generally relating to poor return of results rate by families.

With the younger age groups, I probably just go on history and peak flows. GP04.

I don't tend to use peak flow in the age range that I see... [<8 years] they're not that great and I don't feel it changes management so I tend to go more on history and if I've heard a wheeze. ANP01

It was clear from the initial interviews that the primary/secondary care interface was a social one, yet there were not consistent behavioural norms vocalised by members of either cluster or amongst groups of clinicians about the standard of diagnostic care that should be expected for asthmatic patients. This applied to practical use of asthma guidelines for both adult and paediatric patient cohorts and seemed to be acceptable to the interviewed participants. It is not clear whether inconsistency and apathy, expressed by many, towards conforming to prescriptive guidelines was accepted as normal in this setting because clinicians didn't appreciate the gravity or the potential serious complications associated with poor practice in relation to asthma care; if it reflected a broader ethos in primary care that guidelines are considered suggestive/optional rather than essential; or whether the oft-cited time pressures on NHS clinicians meant that they'd come to accept greater variation in practice standard as normal, despite the consequences.

I think everybody is a bit wishy-washy in their practice, aren't they? GP003

By contrast, there were isolated clinicians who clearly expressed a wish for increased standardisation of practice and felt that educational interventions would be the solution to this.

It would be nice, I think, to have an annual update to go through the current guidelines [...] so then we're all working to them same ones. ANP01

Theme II : Fixation on FENO

The diagnostic FENO test was a key discussion area in all the interviews in both clusters in relation to guideline use. It was the primary manifest reason that the NICE 2017 guidelines were dismissed by study participants. None of the participants had received any specific training or education in its use and application. None considered that it might realistically become a component of their own routine asthma service except for two GPs did volunteer that they had considered the possibility of incorporating FENO testing into their locality by establishing a diagnostic hub. This was in view of suggestions in the NICE 2017 supporting documentation – but neither had made any real steps toward this goal and reported that at present there was no funding to enact this change, and this concern about funding was widespread. Both of these clinicians reported that having done calculations themselves, they had deduced that small rural GP practices in their area could not generate sufficient numbers of patients annually to justify spending money on training staff and purchasing to equipment for every surgery.

The amount of training that would be required, you know, for nurses to do that across multiple practices isn't feasible [...] There isn't the extra resource to do that. It's not like we've been provided with additional resource or additional funds to be able to provide that service. GP01

I think there would be a place for FENO, it's probably going to come down to cost isn't it? I think it probably would be beneficial because you can sort of get quite a bit of information straight away... but I think the cost implication... I can understand why it's just in the hospital... but I think it would be beneficial if we had access to it. PN01

Of note, no link or comparison was made openly by participants to the cost of conducting other forms of diagnostic testing, such as spirometry. Spirometry also requires capital expenditure for staff training and for equipment, but the latent sentiment was that spirometry was such an ingrained component of asthma and COPD care, that a move away from this was inconceivable in current practice format. By contrast, FENO testing was dismissed as farfetched or irrelevant to current practice by many of the interviewed participants.

I've don't even know if they are using it at the hospital, I've never referred anybody for it. ANP02

These statements were convincingly presented as truly held beliefs and it appeared that local teaching, particularly for nurses, had cemented these. Interviewed participants were all *aware* of FENO testing as a diagnostic entity but had for the most part consigned it to the list of investigations which couldn't or shouldn't be done in primary care. Some of the reservations related to NICE 2017 guidelines related to the perceived practical difficulty of performing the FENO test itself or potential limitations to its use, such as in relation to smoking or the number of consumables required. By comparison spirometry which was a perceived as a comfortable, routine and acceptable tool for all and was a familiar part of the asthma landscape.

Nitric oxide testing wouldn't be ideal for the GPs to do as it's not easy. GP04

There were frequent and recurring references to *cost* as a major barrier to the implementation of NICE 2017 guidelines. However, there was clearly a wide variation in the perceived relevance of finances upon day-to-day practice between staff. There were no discernible patterns within clusters in relation to this. A latent theme across both cohorts was that NICE 2017 were perceived as being skewed toward a population-level cost saving agenda rather than toward individual patient interests. In several cases, members of staff reported that they had been told explicitly to 'hold off' implementing FENO by individuals in managerial positions because the cost was prohibitively high. Whilst pervasive, these conversations had often been had informally at educational events but had stayed with them.

The NICE guidelines were updated a few years ago and they were a bit all over the place and from what I can gather NICE are much more about money. ANP02

Considering the economic implications of current practice versus guideline recommended practice was a taboo subject for many participants, including several of the nursing staff who were primarily focused on their own, reportedly very large, cohorts of asthmatic patients and made no reference to the financial limitations of the wider cluster or health board population. Body language during these difficult conversations frequently became more defensive and closed off in what was otherwise open discussion. Participants frequently spoke of motivation

to do whatever they felt was required for *their own* patients e.g. bringing patients back for more lengthy appointments in order to conduct a more thorough history/examination even if this didn't affect the final diagnostic conclusion, and evidently regardless of the cost incurred the clinical time taken.

Theme III : Disempowerment

A concerning finding from this study was that one major barrier to generating change or implementing guideline recommendations was a latent *defeatism* and *lack of empowerment* amongst staff. Rather than making decisions purely in terms of what was going to be of best interest to the patients, staff in some circumstances could not introduce change of their own volition within even their own surgery organisation, despite seeking support from individuals considered to be more 'powerful'. It is concerning that this disproportionately impacts nursing staff in GP practices, despite them delivering the bulk of diagnostic care to asthmatic and suspected asthmatic patients and the subsequent monitoring and annual review process. The nature of the hierarchy between clinical staff did vary between individual practices.

The concept of the 'cluster' as an entity only appeared to exist in the minds of the GPs within them – as a result, essentially a cluster was a network of doctors and *not* a network of surgery's and was entirely to the exclusion of nursing staff. As a result, Cluster identity focused only on GP with no relationship to other actors. GPs were involved in cluster meetings and planning, with a clear and positive sense of ethos; by contrast, nursing staff often were not even aware of the name of their local cluster group and therefore were excluded from the broader professional community, purpose and innovation that the cluster network seeks to engender.

The purposes of cluster working are to allow the freedom to innovate. GP01

It was clear that the practice nurses interviewed rely on individual GPs within their own practice to be able to deliver a diagnosis and management plan to patients with suspected asthma. This was despite the nursing staff reporting that they could see up to 20 patients a week with whom they were evaluating suspected asthma or COPD, considerably more than their GP counterparts. In a busy clinical environment, seeking help meant physically knocking on the

GP door. Each interruption resulted in a disruption to their own appointment schedule and that of the GP, before each consultation could be completed. The process for this was typically leaving the patient and waiting outside of a clinic room until the GP became available. It seemed that during this interruption, the target GP could have been running a clinic, working as 'duty doctor' with acute and sometimes lengthy presentations, or otherwise engaged in educational or managerial work whereas the nurse was in a dedicated respiratory clinic. Each interruption would take time out of a limited schedule for both individuals and also require the patient waits to wait in the consultation room. Despite the nursing staff reporting clear competence and confidence in interpreting spirometric results alone, only when they were empowered to work independently, were they fully using these skills.

By contrast, there were also multiple examples given by participants whereby it was evident that a practice nurse was in fact relied upon to advise GPs in regard to asthma management, but nurses still required GP say-so before a referral could be made to secondary care. One GP in case B did confirm there was an expectation for nursing staff to return diagnostic queries to themselves, rather than referring directly to secondary care.

The local respiratory team, they're very good, they make themselves available [...] in our practice it would come through the doctor [...] I suspect the respiratory physicians would rather it come through one of the GPs first . GP01

This was based on personal perception about what the secondary care consultant might prefer but was, perhaps, unfounded as it was not widely replicated amongst other GPs interviewed. Neither was it reflective of actual practice by the nursing participants in either cluster; many nursing staff reported engaging freely in discussions with secondary care consultants with regard to diagnostic conundrums. This was in the form of informal emails, face-to-face multidisciplinary (MDT) meetings or in written referrals for review. This suggests a discrepancy in insight amongst some GPs about what their colleagues can and should be competent to do independently and what is good use of their time. This is undoubtedly a barrier to effective implementation or production of consistent local policy, but so too is the duplication of work between staff and use of time in non-clinical activity.

Lack of confidence was not uncommon and much of this related to ‘prescriber status’ which appeared to introduce a dysfunctional hierarchy disproportionate to the degree of training in asthma. The practice nursing staff were not able to prescribe medications despite very explicit printed guidance being available to them and on their desk; and in one case despite the availability of in-house pharmacy support. This prescribing support was by no means a widespread occurrence, however. The nursing staff who reported receiving the most frequent and comprehensive asthma education described clinical behaviours which were largely consistent with published BTS/SIGN (2016) guidelines but were dependent for reassurance on GP colleagues who in some cases hadn’t received any formal asthma education for many years. Three GPs reported attending national update courses, which had included asthma education under a more generic respiratory topic banner, but they did not have access to the free study days that the nurses were invited along to.

I always go and speak to the doctor because I’m not a prescriber. PN01

We find that the nurse practitioners, especially if they’re new to the role... they’re coming and asking us, even though they’re the prescribers and we’re not? They’ll come and sort of ask about different inhalers, the GPs are the same really. I feel happy giving the advice but on the other hand I’m like “oh my god, I can’t believe they’re asking me!” when I’m just the practice nurse! PN03

I’ll go back to the doctor and say “They’re better, are you happy for me to put them on the asthma register? And give them a diagnosis”. But obviously if you were an ANP it is it different. But because I’m not a prescriber and I can’t put medications on repeat and things like that... I have to go through a doctor. PN01

There is obviously a wide margin between the expected frequency and volume of training that clinicians receive on asthma depending on their job title. Again, where GPs appear to be empowered to manage for their own learning needs, the nursing contingent were required to defer to management and lacked in control over their own educational activities, despite clearly asserted desires for additional and more frequent training.

None of the GPs interviewed openly recognised or complained about the discrepancy in ongoing training in asthma between staff groups, whereas the interviewed nursing staff were well aware of what training opportunities their colleagues had by comparison. None of the interviewed participants had full control over their educational activities and as expected they all reported having to balance skill-specific training such as spirometry testing, with more wide-ranging activities such as training days for the whole of respiratory medicine. One GP highlighted that typically GP education would take place either in opportunistic meetings or during evenings, and both of which were often incentivised with food to encourage attendance as it was otherwise so poor.

Obviously in general practice we don't get any protected education time at all and so we do a lot of evenings. We don't get people to come after a full day of work without some food. GP04

Theme IV : Gatekeepers

The value attributed to the clinical time of the secondary care professionals tended to be portrayed as being of greater value than that which the primary care clinicians attributed to the own work. There was a frequent fixation on trying to reduce the volume of written referrals to secondary care to protect staff there from excessive or burdensome workload, but little appreciation that by doing this there would have been increasing number of appointments offered for the review and management of cases in their own practice.

I know there is so much pressure on them! ANP01

There were common feelings of pride amongst all clinicians about what could be managed in primary care, independently of secondary care. There was a recurrent expression of a *gatekeeper identify* by all staff; a perception that primary care staff should and would bear the responsibility of protecting the secondary care departments from clinical workload. This was prominent among GPs, who ironically were not themselves directly involved in the performance of diagnostic testing. By contrast, the staff involved in actually performing tests - the practice nurses - frequently reported significant time pressure and stress associated with delivering this.

It's the amount of time that you get in a consultation... you know its 20 minutes to do the spiro and everything else? To check the inhalers and everything- it's not long at all, you're like a robot. You just trying to get ... argh... you're just trying to get everything that's needed. You're just trying to ram it all into a 20-minute slot. PN01

There was no verbal recognition by any GP about the time involved in performing diagnostic testing or of the stress experienced by some staff in getting this completing testing within allocated time slots. All three practice nurses interviewed reported that lack of time with patients affected their ability to do their job well, yet none felt they had control over the length of their own appointments. The GPs did not demonstrate any particular concern or insight into the time pressures on the nursing or allied health professionals placed upon them in terms of performing diagnostic testing. There was a conveyed feeling of anxiety and shame from nursing about performance, which appears to be undermining confidence of nursing staff about their ability.

Each appointment is 30 minutes and I have to do their lung function, I invariably overrun, I know 30 minutes sounds a lot. PN01

It is plausible that this reflects wider sentiment within the NHS that all clinicians are under massive pressure all the time anyway, and so has come to be an expected part of day to day practice for colleagues. However, the unfortunate impact of this is that nursing staff often appeared to lack confidence in their own ability, and as such they are less willing to challenge individuals in authority to enact change – and this translates into stasis in practice. For example, one nurse had raised with managerial staff an idea to introduce change as per the new NICE 2017 guidelines but hadn't felt able to raise the issue on another occasion since then because of being dismissed initially – despite being the one of the more experienced asthma care providers in the surgery.

We've mentioned it to the management and they've sort of said, you know, Betsi wouldn't be providing it . They've got it in the hospital so we've just sort of left it at that really. We did mention it when it was first sort of brought to our attention but yep, we won't be getting it. PN03

Theme V: The Social Network

Within the study, the researcher (FH) adopted the lens of network sciences and integrated it into the qualitative case study work, to provide an additional analytic layering of interpretation to supplement thematic analysis (Braun & Clarke., 2006).

The delivery of asthma care in both case study areas appeared to be dependent upon the functioning of a complex social network, comprised of the individual primary care professionals, GP surgeries and secondary care departments. It was very clear from early phases in the analytic process that the delivery of diagnostic care within both case study areas was reliant upon a network encompassing individual GPs, practice nurses, advanced nurse practitioners, health care assistants and the secondary care team. The core of the network is the individual respiratory consultants who are also present in person at many education days and so have multiple roles as educators, local guideline setters and advisors for individual cases. This is the case for consultants at both District General Hospitals accessible from the case areas. Beyond this, the other individual crucial to the network was the local paediatric consultant with a specialist asthma interest, the advice of whom was highly prized. The social network appeared to be therefore built on a foundation of positive feeling, mutual support, respect, trust and open communication between staff, whereby information was shared about cases constantly – not only as anticipated in the expected formal referral documents, but in email contact, in telephone contact, in informal face-to-face conversations and for one practice, within a collaborative respiratory MDT. These interactions were not perceived by participants as unilateral exchanges, but dynamic two-way discussions.

The support I get from secondary care is excellent... I get letters from them and they all seem very supportive. PN01

This social network was experienced by the interviewed primary clinicians as an important determinant of practice – many made decisions, including about guideline choice, based on information they had received from secondary care. Whilst the cluster units were recognisable to GPs - the ‘insiders’ - clusters were exclusive of nursing staff and as a result did not appear to be representative of the wider localities or current practice. Collaboration occurred between practice nurses within individual practices but there were no examples of this extending to

other practices and there was evidence that this lack of collaboration *between* practices was a source of frustration. Within individual practices, it was apparent that GPs and practice nurses relied on each other (albeit unevenly) for support with diagnostic testing and medication initiation, but GPs in particular appeared to lack insight into the workload of nursing staff and at times were dismissive of their skillset. The other key professional group, the advanced nurse practitioners, tended to sit more separately from other participants, as ‘outsiders’, in that their prescriber status meant they were largely independent from GPs and so didn’t collaborate to the same degree, despite perceiving that they were managing a significant volume of the workload. Given the overall manifest positivity of this social network, it was unsurprising therefore that the backstop position for professionals in primary care was to seek help from secondary care.

If it doesn't quite fit the box and if you don't come to a consensus then I usually refer to respiratory clinic. GP02

Undoubtedly, the informal advice seeking from secondary care will have created a burden of work additional to the formal written referrals made by clinicians to primary care. This remains unclear, but evidently secondary care staff were making time to answer queries and so must have placed some value on these interactions too. Given the strongly positive light under which this relationship is perceived by the primary care staff, it is plausible that such ease of access to informal secondary care support has resulted in a network of primary care clinicians who predominantly ask questions of secondary care rather than seeking help elsewhere e.g. from guideline documents, from educational opportunities or from more localized collaborations between surgeries. Advice seeking behaviour was not limited to specific patients, it also related to primary care clinicians seeking educational support in the delivery of teaching sessions and to overall service design.

The social network therefore facilitated everyday practice, but was a barrier to the identification of local problems and generation of incentive; it appears that so as long as the secondary care team continue to give universally positive feedback to their primary care colleagues, there will be minimal motivation to change practice, properly assess the appropriateness of current guideline use, or effectively evaluate current practice against national standards. A latent consequence of the dependence of primary care upon secondary care appears to be inertia

amongst many community clinicians who are not empowered to orchestrate change and for the few individuals who can identify problematic areas, they rely on the ‘go-ahead’ from secondary care. Rather than exploring what capacity exists for changing diagnostic testing – clinicians deferred to secondary care, dismissing modalities such as FENO in the process.

There were participants, notably in the more distance rural practices, who showed greater appetite for independence from secondary care services. However, the more prevalent sentiment was that this professional social network appeared to bind individuals together in a way that was comfortable ; as a result, it has inadvertently engendered a relationship which may well have restricted adaptive progression in primary care and likely contributed to failure of new guideline implementation.

Specifically, this study centred on mapping networks in primary care and the dependencies and associations through the heuristic of a modified ‘target-concentric circle’ mapping (Bellotti., 2015). As a sociometric tool, it enabled the representation of ‘ego centric’ information from the interpretation of data on actors by the researcher who positioned the actors in relation to how they delineated closeness or distance between relationships in primary care case studies (Case A and B) as part of the process of implementation in primary care. This modified the traditional approach of asking respondents to locate themselves in the middle and then others (alters) radiating out. Consequently, the network analysis uncovered the way in which these networks emerged from the data, supplementing the detailed themes that emerged surrounding implementation. It highlighted how the pivot for implementation was the nature of the social networks in primary care (Figure 3). Practice nurses and GPs within primary care were ‘insiders’ to this network whereas advanced nurse practitioners were lone-wolf outsiders, excluded from both the cluster identity and independent from GPs, but also excluded from the collaboration and informal discussion between practice nursing staff. Nevertheless, the ANPs had separate but positively perceived and functioning relationships with the secondary care clinicians and so they were part of that wider social link with secondary care. The strong arrows between the practice nurses and GPs convey the loose dependency and association between these two staff groups, whereas the advanced nurse practitioners are more distantly associated and less dependent.

Figure 3

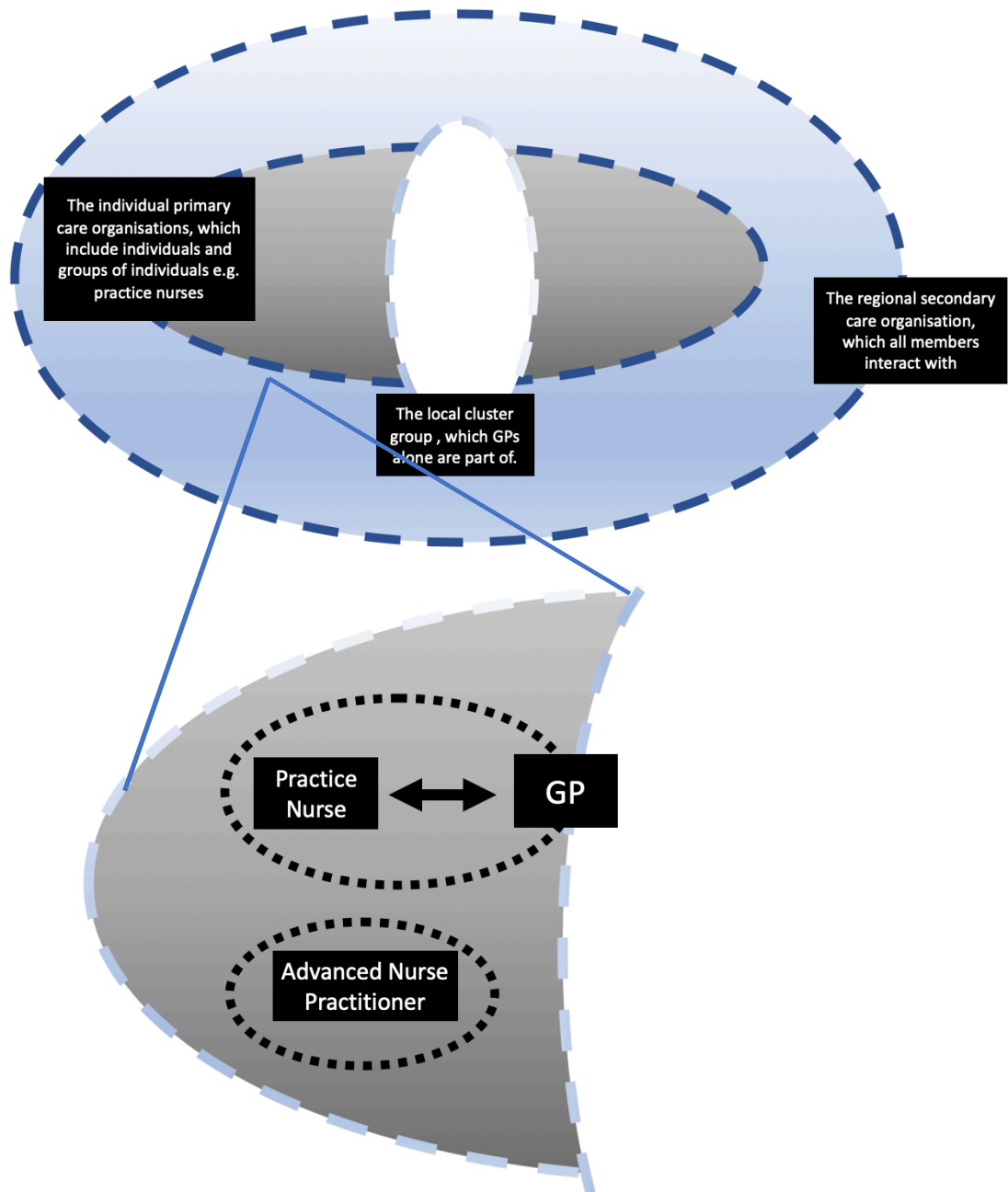


Figure 3: Mapping social networks in primary care case studies: ‘insiders’ and ‘outsiders’ in asthma guidelines implementation. Each individual primary care organisation is heavily linked with its local or regional secondary care hub. This secondary care organisation is a source of clinical advice, education and collaboration and strongly influences behaviours or individual clinicians and organisations within the region. Clusters are groups of GPs who work in different practices but meet periodically to plan services for their region. Their ethos is one of innovation and collaboration. There is no similar structure for nursing staff to collaborate beyond their own practice but within practice there is a lot of sharing of information and support between practice nurses. There is also a strong and reciprocally supportive relationship between practice nurses and the GPs in their practice – shared tasks include prescribing, diagnostic testing and clinical decision making and this is represented by the thick double-ended arrow between these groups. Advanced nurse practitioners are notable in their absence from both cluster working and from practice collaboration in terms of asthma diagnostics. Their prescriber status means they do not rely on the doctors for prescriptions and are expected to make diagnostic decisions independently. They do collaborate with the secondary care colleagues. The dashed lines represent that individuals are working and make their diagnoses as individual groups, there is enough laxity within the social network to allow knowledge, skills and patterns of behaviour to flow between all the involved parties.

VI : Boundary Objects and Brokers

Asthma care delivery is bounded in a social network complex but a complete quantitative social network analysis was not integral to this study; what was important was exploring how clinicians engaged within this social context and what means facilitated this. It appeared that engagement occurred through day-to-day participation e.g. *the informal conversations between GPs and practice nurses*; but also involved physical and conceptual artefacts that reflect shared experience and around which participation was organised – similar to the so-called ‘reification’ proposed by Wenger (2000). Reification in this setting relates to the abstraction of a material object as having capabilities i.e. an object becomes a subject (Petrović., 1965). This reification facilitated power to be projected across the landscape of organisations involved . Within the case studies explored in this study, the BTS guidelines appeared to occupy this role within this very human and social network. In the case studies the object focused on the BTS guidelines had the characteristics of being plastic enough to adapt to local needs and yet robust enough to maintain a common identify across multiple sites. In this way, it seemed to represent a *boundary object*. The conceptual framework of boundary objects was originally proposed by Star and Griesmer (1989), in their landmark paper which looked at the interactions of different groups of individuals involved in the delivery of a zoological research programme.

The BTS/SIGN (2016) guideline appeared in this study as a boundary object – both linguistically, physically and conceptually an artefact which reflected the shared experience of clinicians and around which participation in the network was organised (*Wenger., 2000, Communities of Practice and Social Learning Systems*).

“In natural history work, boundary objects are produced when sponsors, theorists and amateurs collaborate to produce representations of nature. Among these objects are specimens, field notes, museums and maps of particular territories” - (Star and Griesmer 1989).

The BTS/SIGN (2016) guidelines form an intermediary boundary object offering mainly technical information (Kimble., 2010). A boundary object allows collaboration yet doesn’t require consensus – for example when clinicians reported that were using the BTS/SIGN (2016) guideline, this was mutually comprehensible to other staff, but didn’t mean that their

behaviour was exactly the same or their interpretations were identical. This meant that different individuals and groups of individuals were able to work together whilst retaining different perspectives on a shared task e.g. GPs at the cluster meetings or nursing staff at the local MDTs. This mutual understanding only needed to be ‘good enough’, and the sharing of this object provided a reference point around which communication and cooperation could be coordinated. The NICE (2017) guidelines did not appear to occupy the same role.

Kimble (2010) describes how groups of professionals readily share knowledge related to their profession within a network, but for political or professional reasons, do not share this knowledge with outsiders. This appears to be what is happening with the GP cluster meetings and even if they are not named as such, they often exhibit features of Wenger’s (1991) ‘Communities of Practice’, sharing unplanned and unanticipated learning opportunities. Wenger (1991) considered communities of practice to be ‘*groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly*’. The knowledge within a group tends to reflect its own norms and preoccupations; as a result, it is unlikely that the group will generate novel ideas on its own. To do this a group needs the stimulus of fresh ideas and new information from outside. Given that the nurses who receive the updated training in asthma care in were excluded from the groups, it was unsurprising that the clusters were not making significant steps to enact change.

Within the social network of the primary and secondary care clinicians in these case studies it appears that it is the practice nurses who are acting as brokers (Wenger., 1998). A broker is a member of more than one community of practice e.g. of the nursing profession and of the MDT; they are able to make effective communications between different communities and they make coordination possible by opening up new possibilities for learning and exchange. A broker is an individual who translates knowledge created in one group into the language of another so that the new group can integrate it into its cognitive portfolio. For example, the practice nurses were attending the annualised training and revalidation process, and as a result they were translating new information, for example of prescription of inhaled medication, to the GPs. Brokers are not simply translators however and must be able to manage relations between individuals. Unfortunately, because the nurses are perceived by some clinicians to lack legitimacy e.g. in direct liaison with secondary care, their ability to really influence change

is limited. To be effective brokers need to have authority within *all* the groups to which they belong.

Cases A and B both appear to demonstrate what Kimble (2010) terms an '*individually orientated strategy*', whereby the boundary object is used by a broker to limit the amount of information available and to define the direction of a joint enterprise. The nursing staff have received the most training and education in the use of asthma diagnostic guidelines, and therefore broker the translation of the guideline to GPs. They are encouraged at training events to use the BTS/SIGN (2016) guidelines and avoid the NICE (2017) guidelines and as a result have selected a boundary object which favours that interest.

Changes in the boundary object seemed to occur when the former boundary object was no longer able to sustain the innovation process because of its inability to support a discussion that included a wider range of competences. The data suggested that as long as the BTS/SIGN (2016) approach was deemed sufficient and FENO testing was considered superfluous to requirements, there was unlikely to be change.

Theme VII : Apathy towards change

Apathy towards change or progress towards a more robust guideline implementation was generalised across all groups of clinicians, with few exceptions. For one GP, a desire to bring about change had resulted from a U-turn in rhetoric from national organisations, suggesting that GPs were over-diagnosing asthma and that by changing practice costs could be reduced.

For years we've been told we're underdiagnosing asthma and you feel a bit bombarded by people telling you you're doing a bad job [...] and suddenly we're being told we're diagnosing too much. If we are over-diagnosing asthma as much as we're led to believe then that needs fixing. It needs doing... we need to do it in a better way. If we can get people, the correct people, off inhaled corticosteroids then it would be a big cost saving for the drug budget of the health board. GP01

Unfortunately given the rigidity of the network dynamic, the optimistic plans of this GP for their cluster had not been disseminated to other clinicians in the cluster and there was little

appetite for change other staff in that cluster. It appeared that for the most part, clinicians did not recognise any issues with current practice – regardless of the lack of concordance to published national recommendations – because it was perceived as adequate.

I guess the only thing is the nitrous oxide testing, but I've never really felt the lack of it.
GP03.

Unfortunately, it appears that for the cohort of patients with some areas, adequate was good enough and there was little capacity in the system at individual, practice or cluster level to prompt change or improvements.

Chapter 4 : Discussion

This study used multiple case-study design (Yin., 2009) to explore and explain current practice by healthcare professionals delivering community care to patients with suspected or diagnosed asthma in two local regions in Wales. Using semi-structured interviews with a purposively sampled group of clinicians, we gathered a rich dataset which was thematically analysed. Current use of asthma guidelines and perceptions around current these guidelines were explored, as was their reported application within daily practice. The analysis offered an explanation for why asthma care is operationalised in this the setting in this manner, by introducing social networks and boundary objects as implicit barriers and enablers to guideline implementation clinicians. Previous work has demonstrated widespread lack of compliance with national and international asthma guidelines over many years, as assessed by multiple qualitative and quantitative methods including review of patient records, staff surveys and semi-structured interviews (Almutawa *et al.*, 2014; Baker *et al.*, 2003; Eccles *et al.*, 2002; Lougheed *et al.* , 2007; Mold *et al.*, 2014; Rashidian *et al.*, 2008; Ring *et al.*, 2015; Rousseau *et al.*, 2003; Tumiell-Berhalter & Watkins., 2006; Wiener-Ogilvie *et al.*, 2007; Wisneveskey *et al.*, 2008; Yawn *et al.*, 2008)

The findings from this study therefore replicate and reinforce the findings of previous work, but also make a novel contribution pertaining to this local context. Furthermore, this study builds specifically upon sentinel work by Wiener-Ogilvie (2007) and Wiener-Ogilvie (2008), characterising the current use of the two major asthma guidelines in circulation in the UK in a bounded geographical region. It is striking and disappointing that the thematic outcomes of this study bear a strong resemblance to that which was initially demonstrated over a decade ago.

Guideline Choice

Healthcare professionals in both case areas were aware of the two major national asthma guideline documents, but the BTS/SIGN (2016) document was dominant as the guideline of choice for both the diagnosis and management in patients with asthma. Two years after their publication, there was no evidence of application of the NICE (2017) guidelines in the practical diagnosis of asthma in adults or children by *any* of the healthcare professionals who participated in the study in either case study area. There was limited evidence to support that

staff frequently reviewed guideline recommendations, especially when it came to use of diagnostic testing modalities and especially for paediatric patients. There was little distinction between either of the case-study areas in terms of clinical behaviour in the diagnosis of asthma.

Major barriers to the use of the practice guidelines were similar to that reported in previous literature about guidelines generally and specifically to asthma guidelines (Almutawa *et al.*, 2014; Cloutier *et al.*, 2012; De Bruin *et al.*, 2018; Dombowski *et al.*, 2010; Gagne & Boulet., 2018; Lougheed *et al.*, 2007; Ring *et al.*, 2015; Tennen *et al.*, 2009; Tumiel-Berhalter & Hershey., 2005; Wiener-Ogilvie *et al.*, 2008). Explicitly stated by participants barriers to guideline use included lack of trust in clinical appropriateness of the NICE (2017) document; inadequate electronic infrastructure; perceived lack of capital to expand infrastructure; concern about guideline content; lack of perceived applicability/utility within primary care; concern about cost of consumables for performing diagnostic FENO testing; lack of perceived additional patient benefit; and linked concerns about the safety of the asthma management strategy in NICE (2017) as compared to the BTS/SIGN (2016) document.

Expressed reasons *for* using the BTS/SIGN (2016) guideline orientated around familiarity, knowledge of content and perceived superiority. Overtly this seemed to be the product of result of regular targeted education exclusively on the topic of this document for nursing staff who deliver a significant proportion of the diagnostic care. Amongst the participants there was variable desire for change: some participants were satisfied with current practice and saw little room for improvement; others validated previously published concerns about misdiagnosis of asthma but these individuals lacked the support or resources to generate change within their own practices or within the wider region. There appears to contentedness and apathy towards current performance amongst some interviewed staff, which replicates results from previous work such as Ring *et al* (2015). Clinicians did not vocally link local asthma morbidity and mortality with their own clinical behaviour.

Asthma disproportionately affects children yet the clinicians interviewed typically felt more confident in applying guidelines to adult patients. This is a concern given the importance of correct diagnostic confidence, disease stratification, medication use and referral for asthmatic patients. There is both anecdotal evidence and publications which question the appropriateness of these particular guidelines in children; the study results could therefore be a reflection of a

much wider rhetoric and scepticism for this group of patients (Latzin & Fuchs., 2017). Diagnostic practice was most variable for paediatric patients, with explicitly expressed barriers to implementation of *any* guideline in this context being lack of knowledge, perceived patient inability to perform tests and confusion about the safety of initiating inhaled corticosteroids in younger children. Both nursing staff and GPs voiced concerns about the long-term implications of inhaled corticosteroid use, from both a patient safety perspective and a drug budget perspective. Clinicians who had received direct guidance from secondary care paediatricians appeared more confident in the diagnosis of asthma in children, but all clinicians interviewed would refer directly to the local paediatric respiratory consultant if there was diagnostic uncertainty.

Social Determinants

It is not a new finding that communication between professionals is a determinant of effecting practice change amongst staff (Watkins., 2016). The significant success reported in Finland by Haahtela *et al* (2006) was the product of a sustained strategic intervention across multiple regions and targeted individuals, organisations and systems simultaneously in the pursuit of improving adherence to asthma guidelines for patient benefit. Importantly, a key component of this intervention was that doctors *and* nurses from each practice attended training and education days together, rather than there being separate training opportunities for different staff groups. In addition, local collaboration was encouraged. Mold *et al* (2014) also found that *local* collaboration was an effective strategy to improve adherence to asthma guidelines.

Pragmatic coordination between individuals and groups is the most difficult to achieve; change can be costly if the actors have a stake in the established way of doing things and the knowledge that people accumulate and use if often considered to be 'at stake' during the change process (Carlile., 2002). In our study, many participants perceived that FENO testing would be prohibitively expensive. By contrast, participants largely *did not* acknowledge the financial, medical or practical costs of current practice with which they were very familiar and knowledgeable e.g. *how much a spirometry appointment might cost*. Therefore, for the individuals who were most ready to consider changing or updating their practice – the *innovators* and *early-adopters* (Rogers., 1983) - there was little chance of pragmatic coordination with their wider group of colleagues. By reaching agreements about methods, different factions may be able to establish protocols which go beyond mere trading across

boundaries, and begin to devise a common coin or language, which makes collaboration possible (Star., 1989). These protocols cannot simply be the imposition of one world's vision upon the rest and would likely fail if treated as such (Star., 1989). In this context, this means that for as long as it is the GP cluster groups alone set (or do not set) expectations surrounding guideline use and innovation in asthma care, to the exclusion of nursing staff, there will be little genuine prospect of change from the accepted status quo. The BTS/SIGN (2016) functioned as a boundary object which acted as a bridge for common communication, but this cannot effect change without wider alterations to the social system.

Collaboration on asthma within clusters didn't exist – nurses delivered a majority amount of the asthma diagnostic care yet many were *not even aware* of which cluster their surgery belonged to. By contrast, participating GPs often had a clearly delineated abstraction of what it meant to be part of a cluster and also of the proposed *purpose* of a cluster within a region. Instead, there was a functioning ego-centric nodal network, whereby all practices looked to the secondary care teams for support. As a result, the delivery of asthma care by primary care clinicians in both case study areas was heavily influenced by the secondary care team. In one practice there was a distinct educational component of this collaboration and help-seeking from secondary care e.g. the practice nursing staff attending community asthma multi-disciplinary meetings with secondary care consultant. Asthma diagnosis was understood as a multi-step process and something which would take multiple appointments, usually involves the collaboration of more than one healthcare professional. Nodal actors were nurses, GPs, advanced nurse practitioners and secondary care staff. Regular, informal contact between community staff and those in secondary care was widespread with variable connectedness between individuals. The concept of the 'cluster' as a nodal entity was not recognised by the nursing staff, who were not involved in cluster work and largely excluded from any liaison with co-workers in their locality, except when attending regional educational meetings. On the contrary the GPs looked to cluster-working as a mechanism of introducing change and this gave them more ties, compared to the advanced nurse practitioners who were lone-wolf in their relationship with the centre of the network. The cluster format did not seem to be helpful in encouraging standardization of practice between clinicians despite there being motivated individuals within the cluster structure. Educational meetings were very popular amongst nursing staff but excluded GPs, as a result despite the significant overlap in workload and day-to-day collaboration between these groups of staff, their educational grounding and experience

in current asthma care was distinct. This matrix is schematically represented in the summary diagram below (see figure 4, below).

Figure 4

Key barriers to effective operationalisation of asthma care in primary care

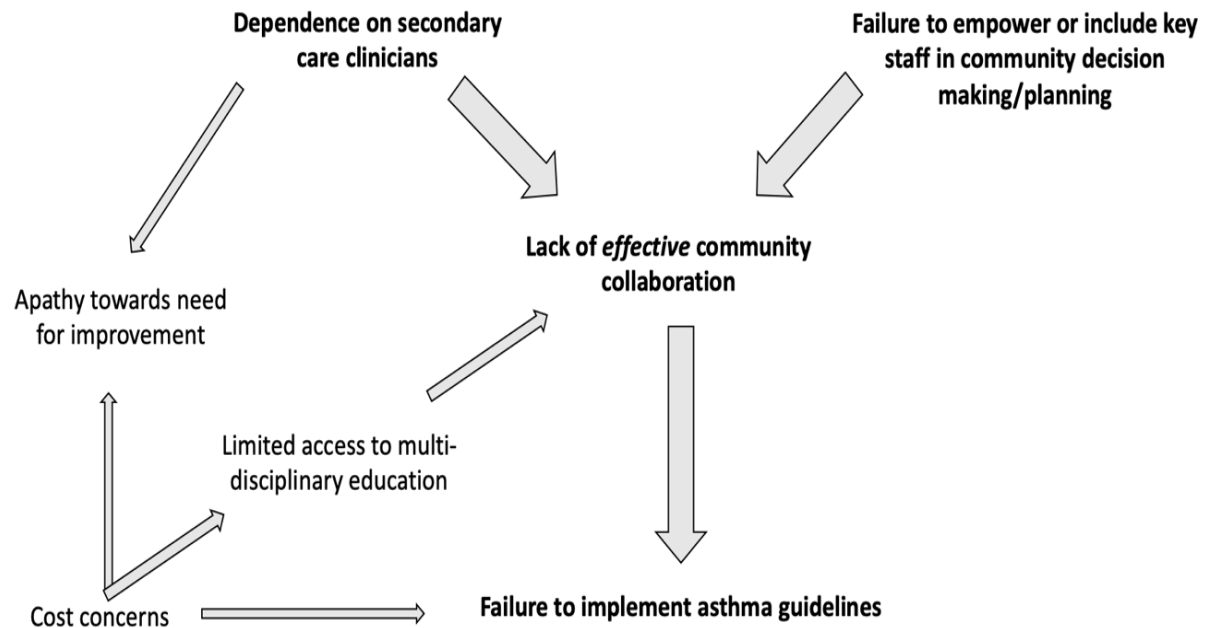


Figure 4: This matrix teases out some the mechanisms between the barriers discussed . For example, e.g. financial limitations on nursing education or lack of inclusion of nursing staff in community collaboration groups are very separate barriers, however both contribute to a lack of effective discussion, collaboration and involvement of stakeholder groups in planning and effecting change within asthma care across the case study regions. The downstream consequences may be wider, but it is clear from this research that the implementation of asthma guidelines is failing as a result and this is represented by the large arrows and the bold texts.

Mold *et al* (2014) explored the effects of facilitating local collaboration between geographically proximal primary care centres and found it to be an effective strategy to improve adherence to asthma guidelines, but one that came with financial implications. Concern about the financial costs of changing or updating practice was widespread amongst participants. A major barrier to more consistent and regular training was the perceived lack of available time and funding for GP education, and lack of prioritisation of asthma against other competing clinical topics.

History taking and clinical examination were routine for all clinicians, with particular focus on atopy, family history and symptoms of cough or wheeze. There was significant reliance on spirometric testing for adult patients, regardless of the pre-test diagnostic probability. None of the participants referred to the categories of high, intermediate or low probability of asthma when discussing their usual practice; although one participant was regularly using a validated symptom questionnaire to assist with diagnosis. Given the significant time burden placed upon nursing staff to perform spirometry, there was a remarkable lack of clarity from participants about which patients did and did not need to undergo this test. Workload for the diagnosis of asthma appears to be shared between GPs and the nurses, but the GPs lacked insight into the time constraints that the nursing staff typically experienced in performing these tests. Spirometry was performed in all practices by nurses or healthcare assistants, but despite nursing staff being educated to interpret results, the GPs often interpreted the results separately. This created workload for GPs and implicitly disempowered nursing staff.

The effect of low confidence and lack of empowerment evident amongst the study participants was similar to that described in the 'hope theory' paper by Tennen *et al* (2009) . In this case individuals were not free to make change or lacked agency to progress along a path and so were less likely to be successful in guideline implementation in comparison to individuals with greater self-efficacy and higher hope. The dismissing of the nurse contribution or nurse abilities e.g. in liaison with secondary care reflected the experience of Roydhouse *et al* (2011), where clinicians undervalued the contribution made by nursing staff. It also supports the findings of Weiner-Ogilvie *et al* (2008) whereby organisations with a flat hierarchy with free-flowing discussion and support between clinicians was typically those with increased use of guideline recommendations. In 2007 when Wiener-Ogilvie *et al* (2007) looked at the use of BTS/SIGN asthma guidelines across a region of North Western Scotland and reported that nurses at the time were not receiving adequate support. What appears to be the case now is that the nurses interviewed were receiving significant support, but this was coming from secondary care and from other nurses within their practice. Furthermore, the nursing staff were largely aware of the potential benefits of being performing FENO testing locally but they lacked access to opportunities to share this knowledge and where proposals had been made by staff, they had been dismissed by senior staff.

Limitations

The context of this study was necessarily bounded geographically and temporally. As such whilst members of staff from each of the major groups were interviewed there was difficulty in recruiting to the study. Other authors have previously struggled with recruitment, namely Roydhouse *et al* (2011) who only achieved 10% of targeted population was recruitment. As a result, whilst this cohort gave a rich and varied account of their practice and there was data saturation in terms of clinical processes, it is possible that there may have been additional nuance and depth to the social network which is not represented in the data. Furthermore, clinicians apathetic or negative towards asthma guidelines more generally could have been disproportionately less interested in participation in the study. Finally, whilst the semi-structured interview gives a wide scope for conversation and data collection, there remains the risk that participants perceive the interview as an interrogation or bias their own narrative about their clinical practice. On the contrary, if researchers were to judge practice to only based on a retrospective analysis of documentation, the richness achieved by thematic analysis is lost entirely.

Recommendations

It appears that there is unlikely to be significant forward change in the local delivery of asthma care within the case study area the unless there is greater involvement of nurses and nurse practitioners in strategic planning. One method of altering this could be for nurses or a nominated nurse advocate/representative to attend cluster meetings. Of note, primary care practices in the UK have already made step-changes by developing a role of nurse partners to help with service planning. There is controversy around this amongst local medical committees <http://www.pulsetoday.co.uk/news/hot-topics/stop-practice-closures/gp-leaders-dont-want-more-non-doctor-practice-partners/20036320.article>. Another consideration could be to replicate the intervention proposed by Haahtela *et al* (2006), whereby greater collaboration between local practices was used as a method to solve concerns about infrastructure and finances e.g. in opening a local diagnostic unit or diagnostic hub. Licskai *et al* (2012) demonstrated a reduction in emergency hospital attendances for asthmatic patients in an area of Canada where an intervention was made to improve community asthma infrastructure. Distributing the workload of new or more technically demanding diagnostic services could be

facilitated by employing a mobile member(s) of staff for the whole cluster; a trained individual who could work clinically across multiple practices within a locality using portable equipment to perform a limited range of tests at the patient's local surgery for a target population of patient's with suspected or diagnosed asthma. If FENO testing was to be introduced, it would require a seismic shift in clinician perception of its utility, application, benefits, limitations and practical use. This could allow for proper and detailed planning but seems an unlikely prospect to be introduced whilst there is such widespread familiarity and reliance upon spirometry testing.

A note on the NICE feasibility assessment

Alongside their main guideline document, NICE published the details of a feasibility study they had arranged to assess how primary care centres would use the proposed guideline. This study involved 7 GP practices across the UK who trialled implementing the guideline between May and October 2016. NICE collected quantitative data on patient outcomes e.g. number of appointments between presentation and diagnosis, compared to the same period in 2015. Researchers also gathered qualitative data through telephone and face-to-face conversations between researchers and staff. As a very blunt assessment outcome, at the end of the process 6 out of the 7 practices agreed "*that they would continue to use the asthma diagnosis algorithm if it remained unchanged at publication*". On the surface this appears to suggest a guideline implementation success however I question how robust this process was and if the results were considered in enough detail given the context. Initially 78 practices volunteered to take part but only 7 were selected. The details of this selection process are not made clear but it appears that it was based on choosing practices from the breadth of patient demographics according to deprivation decile, age and region of England. Each participating practice was given £3000 for involvement, alongside funded training opportunities for staff members in skills such as accredited spirometry certification. Furthermore, each practice was given free access to all consumables required to deliver FENO testing as well as 1 hour of education on its use and free use of a FENO device. Unless NICE intends to nationally fund implementation in this same way it cannot be considered that this is reflective of a real-world implementation strategy. Another major concern is that all sites commented on the difficulty of performing spirometry on children under the age of 8 but this did not translate into amendments to the guideline, which only states that children under the age of 5 cannot perform the objective tests. This leaves a

gaping hole in the guidance for the approximately 200000 5 to 7-year olds in the UK affected by asthma (Office for National Statistics., 2014). The reported data appears to show that during the implementation project, the average time to make a diagnosis of asthma rose from 49 minutes to 57 minutes and there is no acknowledgement of this in the guideline. Finally, the authors propose the idea of a ‘hub and spoke model’ whereby GP practices could collaborate across an area to use a single location for asthma diagnostics. Whilst this would align with our findings that collaboration may well improve use of the guideline, it doesn’t recognise that collaboration is not occurring across all clinician groups. Furthermore, for as long as the nursing staff who are fundamental to diagnostic testing remain disempowered to collaborate beyond the walls of their own practice building, this is likely to be a very challenging model to achieve.

Conclusion

Asthma care in the community is operationalised within a social context. Guidelines can be boundary objects which facilitate communication between separate individuals and groups of individuals in the social network. Considering the role and relations of different staff groups helps to tease out the influence of disempowerment in opening a pathway for improvement and change. The findings are specific to the context of the two case areas studies, but the broader concepts raised could be considered for extrapolation to other regions of the UK and other healthcare networks. The results replicate and corroborate much of the existing literature base, particularly with regard to major barriers to guideline implementation in the primary care setting. Extensive literature from Europe, the United States, Australia and the Middle East makes clear that this is not a phenomenon limited to the UK or indeed to asthma and it is well known that to successfully implement a clinical practice guideline requires the attainment of prerequisite stepping stones, including an appetite for change (Greenhalgh., 2018; Rogers., 1983).

Individual, system and organizational factors will continue to influence guideline uptake unless there is a comprehensive and cohesive strategy including funding, educational interventions and regional collaboration. As recognised by Plsek and Greenhalgh (2001), within a system as complex as the NHS there are inherent tensions and opposing parts; simplistic or unilateral

interventions can create change but need to be considered within the wider context. Since the data collection, representatives from BTS, SIGN and NICE have met to discuss the development of future asthma guidelines. All three organisations have issued a statement of a proposed plan to work *together* to develop a single co-badged guideline <https://www.brit-thoracic.org.uk/about-us/pressmedia/2019/bts-sign-and-nice-to-produce-joint-guideline-on-chronic-asthma/>. This may reduce confusion among clinical staff, but it will not resolve and does not consider the other more complex and nuanced barriers that exist on the shop floor of asthma care as it is delivered to patients. Nor will it necessarily improve the care provided to paediatric cohorts who are disproportionately affected by this disease yet where there was the widest variation in practice and little clarity on diagnosis. As a result, there is a risk of further stagnation in progress and ongoing failure to adequately curtail the morbidity and mortality associated with a diagnosis of asthma.

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Appendices

Appendix 1 : Example of coding frame document

Coding Frame	
Data Extract	Code(s)
GP1 "Asthma is diagnosed on the basis of symptoms, and with an attempt at making some objective measurements of reversibility"	1. Asthma is a clinical diagnosis 2. Objective tests are not universally performed
GP1 "We tend to find that the most useful tool is serial peak flows"	3. Current practise is bedside testing
GP1 "Serial peak flows are how most people do it"	4. GP behaviour is consistent across the cluster
GP1 "In most of the practices in Central & South Denbighshire, most of them [new asthma patients] would be seeing a doctor"	5. Cluster identity 6. Doctors diagnose new patients
GP1 "Once a diagnosis is established the nurse would follow up"	7. Nurses do asthma follow up
GP1 "Most of [my practice] is in line with BTS guidance rather than NICE because NICE isn't workable at the moment... because... you know... we don't have FENO testing"	8. Clinician aware of existence of key asthma guidelines 9. NICE guidelines are not workable 10. FENO testing is a critical part of NICE guidelines
GP1 "We don't have FENO testing... and we were to try and do something around purchasing FENO testing. Its too expensive. The kit is expensive. The consumables are expensive"	11. Lack of Equipment 12. Limited financial means (locally)
GP1 "For a practice our size we might be looking at... four or five new diagnoses of asthma a year, and I think the FENO testing comes in a pack of 500 or something ridiculous and costs thousands of pounds... and then would go out of date very quickly"	13. Equipment isn't designed for a small GP practice 14. Diagnosing asthma isn't a regular occurrence
GP1 "We'd make a very big investment with.. You know... there is no reimbursement for that investment and you know four or five diagnoses its just not financially feasible to be able to provide that... even in a larger practice. The biggest practice in our cluster is 9 or 10000 patients and even with those numbers they just don't have the throughput or the finances to justify purchasing the equipment and the consumables"	12. Limited financial means 13. Equipment isn't designed for a small GP practice
GP1 "There is a big grey area [in the FENO testing part of the NICE guidelines] as well and that needs a bit of interpretation... and having conversations with the respiratory team actually you need someone who knows that they're doing it and its quite skilled and probably, you know best done by a respiratory technician"	15. NICE guidelines are ambiguous 10. FENO testing is a critical part of NICE guidelines 16. Interpreting FENO test results is not a GP job 17. The secondary care respiratory team are a source of guidance
[Have you had training in FENO testing] GP1 "No." [...or interpreting results?] GP1 "Nope." (Shakes head)	16. Perception that FENO test results cannot be interpreted by GPs
GP1 "The amount of training that would be required, you know, for nursing, for nurses to do that across multiple practices isn't feasible either [...] There isn't the extra resource to do that. Its not like we've been provided with additional resource or additional funds to be able to provide that service"	9. NICE guidelines are not workable 19. Training nurses is expensive 40. Concern about competence of other staff
GP1 "We have educational sessions [...] it was clear that we'd always done things a certain way [...] and umm, NICE guidance suggests that we should be doing a different way"	4. GP behaviour is consistent across the cluster 20. Implementing NICE guidelines would require culture change
GP1 "No one's gone down the line of getting fully trained or how to deal with FENO testing..."	16. FENO testing is not a GP job 4. GP behaviour is consistent across the cluster
GP1 "GP education [...] its self-directed learning, I found out about [BTS/SIGN guidelines] going on a course" "No, no, no. I really don't think there is [a standardised roll out of information of training] for anything. It's kind of left to the individual to feel their way through what is relevant"	21. GPs do not receive consistent training 22. Discourse between guideline bodies & GPs

Participant Information Sheet (English Version)

Title of Project

An exploratory study on the implementation of national guidelines on the diagnosis of asthma within different primary care clusters in Betsi Cadwaladr University Health Board (BCUHB).

Background

We are conducting a study looking at the use of recent national guidance on asthma diagnosis by healthcare professionals within primary care in BCUHB. This project is part of an educational project.

Asthma is a common respiratory condition affecting many adults and children in the UK and around the world. Diagnosing asthma can be challenging and there are several different guidelines on the diagnosis of asthma and these are updated regularly. We know that implementing guidelines in the real world can be challenging. We would like to know how the national asthma diagnostic guidelines are used in primary care in BCUHB and to see what factors help or prevent professionals from using these guidelines. To answer this question, we are going to be interviewing professionals involved in the diagnosis of asthma in primary care. We will be interviewing between 10 and 20 people across two primary care clusters in BCUHB.

What do I need to do?

If you are happy to participate, we'll arrange a time and a date for the interview when convenient to yourself. The interview will take approximately 45 minutes to 1 hour complete.

Confidentiality

We will not discuss the interview with any of your colleagues and anything you say will remain confidential. Only the research team will have access to the full transcripts data and the original voice recording will be destroyed immediately after transcription. Information will be held on a secure computer within BCUHB. This will be held for five years and then destroyed, which is standard practice.

Withdrawal

You can withdraw from the study at any time without affecting your rights, but data collected up to your point of withdrawal may be used. You can stop the interview at any time. You do not need to give a reason if you change your mind about participating. and will be made anonymous at the point of transcription and then deleted.

Who is organising and funding this study?

This study is being conducted collaboratively by researchers from Bangor University and Betsi Cadwaladr University Health Board (BCUHB).

What will happen to the results of this study?

The results will be used to help us to better understand the provision of asthma care in BCUHB. This could help with planning service delivery in the future and improve patient care.

Who has reviewed this study?

The research project has been scrutinised by an independent group of people, called a Research Ethics Committee. This is to ensure that your interests are protected and the study is conducted according to the highest ethical standards. This study has been reviewed and given favourable opinion by the School of Health Sciences Ethics Committee at Bangor University. In accordance with standard practice, the insurance arrangements for the study are provided by the Sponsor, who is Professor Chris Burton, Head of the School of Health Sciences at Bangor University (01248) 382556.

Complaints

If you have a concern about any aspect of the study, you should ask to speak to Professor Paul Brocklehurst, who will answer your questions (using the contact details that are provided above). If you remain unhappy and wish to make a formal complaint, you can do this by contacting Professor Chris Burton, Head of the School of Healthcare Sciences at Bangor University (01248) 382556 c.burton@bangor.ac.uk.

Further information and contact details

Specific information about this research study can be obtained from Professor Paul Brocklehurst (contact details are at the top of the page).

Participant Consent Form (English Version)

IRAS ID: 255201

Centre: Betsi Cadwaladr University Health Board & Bangor University

Study Number:

Participant Identification Number for this trial:

CONSENT FORM

Title of Project: Asthma Guideline Implementation Project

Name of Researcher: Dr Fiona Hares

Please initial box

1. I confirm that I have read the information sheet dated 02/10/2018 (v1) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.
3. I agree to the interviews being recorded and written out in full;
4. I agree that anonymised quotes may be published;
5. I understand that relevant data collected during the study, may be looked at by individuals from Bangor University and BCUHB where it is relevant to my taking part in this research;
6. I understand that the information collected may be used to support other research in the future, and may be shared anonymously with other researchers.
7. I agree to take part in the above study.

Name of Participant Date Signature

Name of Person Date Signature
taking consent

Consent form_version_1.1_13/10/2018

When completed: 1 for participant; 1 for researcher site file; 1 to be kept in medical notes.