University of Southampton

Faculty of Environmental and Life Sciences

School of Health Sciences

An Investigation into the Decision-making Processes of Nurse Prescribers in the Management of Acute Illness in Complex Patients Presenting to General Practice Using Think Aloud and Staged Vignettes.

by

Annabel Dorothy Herklots

Thesis for the degree of Doctor of Philosophy

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Abstract

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An Investigation into the Decision-making Processes of Nurse Prescribers in the Management of Acute Illness in Complex Patients Presenting to General Practice Using Think Aloud and Staged Vignettes.

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Nurses in general practice are increasingly taking on traditional medical roles such as diagnosis and prescribing of medicines to meet the growing demands of general practice. Additionally, they face increasingly complex decision-making in a society where it is common for older adults to have two or more chronic conditions (multi-morbidity) and to be taking multiple medications (polypharmacy). It is known that prescribing for such patients is complex and a cause of frequent error in general practice. Nurse independent prescribers (NIPs) are required to be competent in assessment and diagnosis prior to undertaking prescribing training but there is no standard pathway or training to prepare nurses for this role. NIPs in general practice frequently undertake the assessment of patients presenting acutely with undifferentiated and undiagnosed conditions in an increasingly complex population. Complex decision-making is a key requisite for nurses undertaking these roles in general practice, yet little is known about the decision-making processes of this group of prescribers.

This study used think aloud method in response to complex vignettes to explore NIPs' decision-making processes. A novel use of staged vignettes was piloted and used to maximise insights into the complexity of decision-making associated with the assessment and treatment of this patient group. In addition, semi-structured interviews were used to explore how NIPs justified and explained their decision-making. Fourteen general practice NIPs whose role included the assessment and treatment of patients presenting with undifferentiated and undiagnosed conditions participated in the study and data collection continued until data saturation was achieved. Thematic analysis was used to analyse think aloud data and data from semi-structured interviews.

The study findings showed NIPs' decision-making in response to complex vignettes to be underpinned by both analytical and intuitive processes, the quality of which were dependent on the knowledge, experience and clinical exposure of individual NIPs. There was a wide range of

clinical experience and academic qualifications amongst the NIPs which revealed pockets of expertise in dealing with some vignettes and a high level of referral to the GP for others. This varied between and amongst the participating NIPs. The use of intuitive processes by some participants was facilitating in the management of uncertainty and complexity in some vignettes but represented an area of risk where it was relied on to determine the content of the consultation and meant that some complex aspects of the vignettes such as non-adherence to medication were overlooked.

Several organisational factors were shown to influence the decision-making of NIPs. The majority of NIPs undertook independent, time-limited clinics which were found to shape the content of their consultations and encourage a satisficing approach to complex presentations informed by intuitive processes and risked incomplete assessments. Furthermore, the pressure of time reduced the opportunity for mentorship and development. A minority of NIPs worked alongside GPs and a team approach was taken which enabled flexibility in consultation times, appropriate allocation of skills and encouraged mentorship and support from GPs.

This study has shown NIPs bring valuable expertise to the management of complex patients presenting acutely to general practice. Sound underpinning knowledge alongside clinical experience and exposure is critical to ensure optimal decision-making by NIPs managing this group of patients. Furthermore, NIPs require both adequate time in which to undertake consultations to ensure aspects of complexity are not overlooked, and accessible support from GPs in order to develop their practice.

Consideration needs to be given to the working practices of NIPs in general practice to ensure that their expertise is appropriately used and that mentorship and opportunities for development are available in order to maximise their contribution to the general practice workforce and improve patient experience. Adopting a team approach to managing this patient group has the potential to reduce the pressure of time limited appointments and allow individual expertise to be targeted to enhance patient care and provide opportunities for learning and development. Furthermore, dedicated teaching addressing complex patient presentations should be considered by Higher Education Institutions as a priority for the non-medical prescribing curriculum.

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Research Thesis: Declaration of Authorship

Print name: Annabel Dorothy Herklots

Title of thesis: An Investigation into the Decision-making Processes of Nurse Prescribers in the Management of Acute Illness in Complex Patients Presenting to General Practice Using Think Aloud and Staged Vignettes

I declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

I confirm that:

1. This work was done wholly or mainly while in candidature for a research degree at this University;
2. Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
3. Where I have consulted the published work of others, this is always clearly attributed;
4. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
5. I have acknowledged all main sources of help;
6. Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
7. None of this work has been published before submission

Signature: Date: 12/9/22 .....

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Abbreviations

ACP..... Advanced Clinical Practice

ANP ..... Advanced Nurse Practitioner

BNF ..... British National Formulary

CAP..... Community Acquired Pneumonia

CCG ..... Clinical Commissioning Group

COPD..... Chronic Obstructive Pulmonary Disease

CPD ..... Continuing professional development

DVT ..... Deep vein thrombosis

FICM..... Faculty of Intensive Care Medicine

GP..... General Practitioner

HRA ..... Health Research Authority

IPT ..... Information Processing Theory

LRTI ..... Lower respiratory tract infection

NIP ..... Nurse independent prescriber

NMC ..... Nursing and Midwifery Council

NMP ..... Non-medical prescriber

NP ..... Nurse Practitioner

PE ..... Pulmonary embolism

RCEM ..... Royal College of Emergency Medicine

RCGP ..... Royal College of General Practitioners

RCN ..... Royal College of Nursing

Chapter 1 Background

1.1 Introduction

This chapter will outline the background to the research study. I will first consider my clinical and academic experience and how this led to the research question. The development of the nurse independent prescriber (NIP) role in UK general practice will then be discussed and the effect of this role development on the clinical decision-making of NIPs and the extent to which complexity impacts on their decision-making will be considered. At the end of the chapter a brief overview of the thesis structure will be given, outlining the content of each chapter.

1.2 My background and development of the research question

My clinical career as a nurse has been predominantly based in primary care. Over the years I have had many roles based in both community and general practice settings which have contributed to my development and informed my practice enabling me to undertake my most recent role as an Advanced Nurse Practitioner (ANP) in general practice. This advanced practice role involves the diagnosis and treatment of undifferentiated and undiagnosed conditions. Whilst working as a practice nurse early in my career I was given the opportunity to complete a funded university module in History Taking and Physical Assessment. This was the trigger that led to the undertaking and completion of an MSc in Advanced Clinical Practice and subsequently my doctoral studies. Whilst working as an ANP in primary care the opportunity arose to teach on the Advanced Clinical Practice programme at the university and I was seconded to the university for two days a week. It was at this time that my interest in the research area that became the focus of my doctoral studies developed. Having driven my own academic and clinical path to ensure I had sufficient knowledge and experience to support the clinical roles I had undertaken, I became aware of an inconsistency in the academic qualifications and clinical experience of NIPs in general practice who were undertaking the ANP role. This was reinforced by experience from my university teaching role which highlighted a situation in which nurses could become prescribers with no requirement for any formal training in diagnosis or physical examination and enrolment on the prescribing programme required only sign off from the students' employers. This seemed inadequate preparation for NIPs undertaking roles in general practice that involved making a medical diagnosis and prescribing treatments for undiagnosed and undifferentiated conditions. In addition, earlier experience as a community matron had made me aware of the complexity and multifactorial nature of the decision-making associated with multi-morbidity and polypharmacy. Consequently, I became increasingly interested in how decisions were made by NIPs in general

practice some of whom had little experience in this area and limited training beyond their prescribing qualification.

At the start of this research project and at the time of the research interviews I was working in both a clinical and educational role, but over the last few years I have moved to a full-time educational role teaching on the Advanced Clinical Practice programme. I believe that my clinical and academic experience puts me in a unique position to explore this complex area.

1.3 Overview of general practice nursing

The role of the nurse in UK general practice has changed dramatically over the last thirty years in response to an ageing population, an increasing number of complex patients with multiple co-morbidities and a drive to shift the focus of patient care from hospitals to the community (Health Education England, 2017). The development of general practice nursing is recognised as being a key contributor in ensuring the necessary skills are available to meet the growing demands of general practice (National Health Service, 2019). Nurses in general practice have increasingly taken on roles traditionally undertaken by the medical profession which has resulted in the expansion of nursing in general practice. A lack of uniformity in training has resulted in confusion regarding the roles and titles of general practice nurses (Leary *et al.*, 2017). These roles have recently been represented in a career and capabilities framework published by Health Education England (Health Education England, 2021) which describes the distinguishing and overlapping features of nurses working at an enhanced and advanced level of practice. Both levels require a prescribing qualification but advanced level nurses are expected to have a relevant masters level qualification or equivalent and practice with a high level of autonomy and expertise (Health Education England, 2021).

Training nurses to prescribe has the potential to increase capacity, release general practitioner (GP) time and provide seamless care for patients (Health Education England, 2017) with statistics showing that approximately 33% of general practice nurses hold a prescribing qualification and 8% an advanced nurse practitioner qualification (Queen's Nursing Institute, 2015). Advanced and enhanced nursing roles are therefore fundamental in addressing the shortage of GPs, the increase in patient demand and managing the increasing complexity of care delivered in general practice (Health Education England, 2021).

1.4 Nurse prescribing

Nurse prescribing has developed over the years, with significant changes in 2006 allowing nurses to independently prescribe any medicine for any medical condition including some controlled drugs, and a further amendment in 2012 extending prescribing rights for controlled drugs (Royal College of Nursing, 2017). Data from the Nursing and Midwifery Council (NMC) register shows there were approximately 50,000 nurse independent/supplementary prescribers (NIPs) in 2021 (Nursing and Midwifery Council, 2021). NIPs are required not only to achieve competence in pharmacology and the prescribing of medicines, but also to be responsible and accountable for assessing patients with diagnosed and undiagnosed conditions and in formulating a clinical management plan (Department of Health, 2006). The ability to diagnose is an essential requisite of a prescriber where the ability to make an accurate diagnosis is key to therapeutic success (Croskerry *et al.*, 2017). Appropriate assessment and diagnostic skills are a pre-requisite to enrolment on the prescribing programme, and whilst it is a requirement for employers to sign confirmation of applicants' competence in this area, the level of training this represents is not specified (Nursing and Midwifery Council, 2018a).

The Nursing and Midwifery Council (NMC) undertook a review of its educational standards in 2018, and adopted the Royal Pharmaceutical Society's (RPS) 2016 and the later revised 2021 competency framework for all prescribers (Royal Pharmaceutical Society, 2021). Key to safe prescribing is the understanding that NIPs work within their prescribing scope of practice (Royal Pharmaceutical Society, 2021). This scope of practice represents the prescribing activity of the individual prescriber (Royal Pharmaceutical Society, 2022). The framework recognises a common set of competencies underpinning prescribing practice regardless of professional background (Nazar *et al.*, 2015) These competencies reflect the knowledge, skills and professional behaviour required for safe and effective prescribing practice (Royal Pharmaceutical Society, 2021). The scope of practice of an individual NIP is determined by self-assessment of their competence to complete a prescribing intervention. These new standards were implemented in January 2019 and endorse the requirement of prescribers to be proficient in diagnostic, assessment and decision-making skills. For NIPs working in roles where they are accountable for making diagnoses that inform prescribing decision-making, awareness of the limits of their scope of practice is of prime importance for patient safety. Where there is no requirement for standardised training in assessment and diagnostic skills for NIPs there is a risk that NIPs may be unaware of deficits in their knowledge. This is of particular concern as NIPs can now apply to become prescribers with only one year's post-registration experience, where previously three years was the minimum requirement, reflecting the change in the undergraduate curriculum where nurses are now

expected to be 'prescribing ready' at the point of qualification (Nursing and Midwifery Council, 2018b).

The Royal Pharmaceutical Society (2021) framework stipulates the competencies required to undertake a prescribing consultation. In addition to skills in medical history taking and diagnosis they promote a patient centred approach encompassing adherence to medication, psychosocial factors and shared decision-making. There is limited research that investigates the consultations of nurse prescribers however, there is evidence that in the management of some long-term conditions NIPs achieved high patient satisfaction (Stenner, Courtenay and Carey, 2011; Courtenay *et al.*, 2015) and may take a more holistic approach than GPs (Riley *et al.*, 2013) . However, studies comparing GPs, NIPs and pharmacist prescribers' consultations in primary care found that limited attention was paid to shared decision-making by each professional although patients expressed more satisfaction with NIP consultations than those of GP and pharmacist prescribers (Weiss *et al.*, 2014).

NIPs have been shown to be safe and effective prescribers (Latter *et al.*, 2010; Naughton *et al.*, 2013; Weeks *et al.*, 2016) and studies that compare prescribing consultations of NIPs to those of medical prescribers show NIPs achieve similar outcomes (Weeks *et al.*, 2016). However, there is some indication of inappropriate prescribing in older adults and people with complex medical conditions (Naughton *et al.*, 2013) and NIPs have been shown to experience discomfort when prescribing for complex patients and seek support or refer to another prescriber in these situations (Maddox *et al.*, 2016). This suggests that generally NIPs work within their scope of practice but there is a risk when making complex prescribing decisions that they may not recognise the limits of their knowledge.

1.5 Nurse prescribers in general practice

Nurse independent prescribers (NIPs) work in a variety of roles in general practice. Health Education England (2021) in their framework for general practice nursing differentiate between NIPs working at an advanced and enhanced level not only by the requirement for advanced level NIPs to have a master's level qualification but in their ability to independently complete episodes of care, from initial presentation to discharge. Typically, advanced level NIPs are skilled in the assessment and management of patients presenting with undiagnosed and undifferentiated conditions. The descriptor of enhanced level NIPs is more reflective of those who have specialist knowledge in chronic disease management but importantly an overlap between the two roles is recognized where some nurses at the enhanced level may develop 'advanced' clinical aspects of their role (Health Education England, 2021), for example, a nurse specialising in diabetes may also

run a minor illness clinic. This is representative of many nursing roles that have developed over time in general practice, but lack of standardisation or regulation of training has resulted in an ambiguity regarding job roles and titles (Leary *et al.*, 2017; Health Education England, 2021). It is suggested within the framework that enhanced level nurses are called 'nurse practitioners' or 'senior practice nurses' and advanced level nurses 'advanced nurse practitioners' but this terminology has yet to be universally adopted and consequently there exists a lack of consistency in the application of these titles.

Within general practice, therefore, there exists a unique group of NIPs who are required to work autonomously and make both diagnostic and prescribing decisions for patients presenting with acute illness which is undifferentiated and undiagnosed, skills that have historically been considered to be in the medical domain (Weiss, 2011) and for whom, other than a prescribing qualification and unlike their medical counterparts, there is no mandatory training pathway. Consequently NIPs undertaking this medically focused role are at risk of inadequate support, vulnerable to error and potentially present a risk to the public (Brook and Rushforth, 2011).

1.6 Decision-making

Clinical reasoning can be defined as the thinking and decision-making processes required to take the best judged action in a clinical context (Higgs and Jones, 2000). The term clinical reasoning is interchangeable with terms such as clinical judgement, clinical decision-making and diagnostic reasoning (Thompson and Dowding, 2002). A useful distinction can be made between judgements and decisions in which a judgement can be defined as an assessment of alternatives whilst a decision is defined as the choice between alternatives (Thompson and Dowding, 2002). Traditional nursing roles can be considered to focus on making judgements regarding patient management and treatment and differ from the judgements that inform diagnostic and prescribing decision-making typically associated with medical practice (Cioffi, 2002). Therefore, those NIPs in general practice who undertake enhanced and advanced practice roles which include the diagnosis and treatment of undifferentiated and undiagnosed conditions are required to undertake clinical judgements and make clinical decisions that extend beyond their original registration. Decision-making processes in the context of this role can therefore be considered to be the cognitive processes underpinning diagnostic and prescribing decision-making. Whilst medical decision-making has been much researched, to date there is little research into the decision-making processes of nurse prescribers (McIntosh *et al.*, 2016; Djerbib, 2018). Whilst preparation to diagnose and prescribe is integral to the training of medical students these are considered advanced practice skills for nurses and are acquired post registration (Carter, Chapman and Watson, 2021), although recent changes to the standards for nurse education

demonstrate a recognition of the developing role of nurses in medicine management (Nursing and Midwifery Council, 2018a). The decision-making processes required to diagnose and prescribe are embedded early in the career of doctors, whilst nursing students are taught a more holistic approach to clinical decision-making; consequently, nurses undertaking new skills of diagnosis and prescribing are presented with a particular challenge in which their decision-making processes developed through nursing assessments may not be appropriate for diagnosis and prescribing.

1.7 Decision-making theory and nursing

Many theories have been used to explain the decision-making of nurses however, historically information processing theory and the intuitive-humanistic model, have been influential in the interpretation of decision-making in nursing (Thompson, 1999; Ritter, 2003; Banning, 2008; Dowding, 2009; Krishnan, 2018). Information processing theory (IPT) has its roots in medical decision-making, but is equally considered applicable to nursing (Krishnan, 2018). IPT states that human reasoning is bounded by the capacity of the human memory (Newell and Simon, 1972) and recognises the limited capacity of the short term and working memory to hold information (Carnevali, 2000; Bucknell and Aitken, 2010). Terms such as 'chunking', 'schema' or 'scripts' are used to refer to the clustering of data into meaningful units and represent the structuring of knowledge and the conservation of space in the working memory (Carnevali, 2000; Offredy and Meerabeau, 2005).These patterns, which become more sophisticated with increased knowledge and experience, are used to encode and recall information from the long term memory (Carnevali, 2000).

IPT as a cognitive framework to explain how nurses make decisions is represented by a number of models of which the hypothetico-deductive model is commonly used to represent clinical reasoning. In this model a limited number of hypotheses are generated from the interpretation of cues from a clinical encounter. The hypotheses are then tested through further enquiry and evaluated to arrive at the most likely diagnosis (Higgs and Jones, 2000; Thompson and Dowding, 2002). A criticism of the hypothetico-deductive model applied to nursing is, by assuming a rationalist approach, aspects such as emotions, social interactions and context, which are likely to be influential to the decision-making process and key to the nursing mandate, are ignored (Krishnan, 2018). Moreover, research has shown that the analytical approach represented by the hypothetico-deductive model may not fully explain reasoning processes, and that in situations that are uncomplicated and familiar the deductive process may be bypassed and a process of pattern recognition used in order to make a judgement (Offredy, 1998; Higgs and Jones, 2000; Manias, Aitken and Dunning, 2004). Pattern recognition is considered by some authors as a separate model in itself (Offredy, 1998; Higgs and Jones, 2000; Yazdani, Hosseinzadeh and

Hosseini, 2017) and it has been argued that it can be interpreted within the framework IPT as the clustering of data used to access information from the long term memory (Thompson, Moorley and Barratt, 2017). Pattern recognition used to make judgements in this way can be considered representative of an intuitive process (Croskerry, 2009c; Trimble and Hamilton, 2016).

The intuitive-humanistic model is based on work by Benner (1984) who identified intuition as a key aspect of expert decision-making. This approach relies less on scientific based knowledge but more on an individual's perception of a situation (Krishnan, 2018). Benner, Tanner and Chelsa (1996) defined intuition as a judgement without rationale which is made by drawing on experience and is characterised by an instinctive awareness and response without recourse to analytical thinking. This represents a move away from a reliance on analytical processes associated with less experienced nurses towards an ability to gain an intuitive grasp of a situation and proposes that a requirement to attend to formal rules or models may conversely result in a deterioration in the performance of an expert decision-maker (Benner, 1984).

Pattern recognition has been associated with the intuitive-humanistic model, where defining characteristics of a situation are recognised and used by the clinician to grasp the situation as a whole (Benner, Tanner and Chelsa, 1996; Banning, 2008). Simon (1990) described intuition as nothing more than pattern recognition which is triggered by cues that gives access to information in stored memory. This bears similarities to the 'chunking' of information defined in IPT.

There is considerable debate in the literature regarding the definition of intuition (Thompson and Dowding, 2002). Benner, when describing the intuition of expert nurses, appears to present intuition as subtly different from the chunking and recognition of patterns associated with IPT. Intuition is believed to occur when understanding is perceived as a whole and is distinct from the usual linear and analytical reasoning processes (Benner and Tanner, 1987). Pattern recognition is considered just one of six key aspects of intuitive judgement; pattern recognition, similarity recognition, common sense understanding, skilled know-how, salience and deliberative rationality (Benner, 1984; Krishnan, 2018). This 'understanding without knowing' (Benner and Tanner, 1987), which is internalised to the practitioner and indecipherable to the observer, is considered the hallmark of expert practice and undertaken in the absence of analytical processes. Benner and Tanner's (1987) distinction of intuition represented by the intuitive humanistic model from pattern recognition represented by IPT is supported in the nursing literature with definitions of intuition including terms such as gut feeling, instinct or presentiment (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003; Chen *et al.*, 2016; Rosciano *et al.*, 2016; Williams *et al.*, 2017).

IPT and the intuitive humanistic model represent different aspects of decision-making. The hypothetico-deductive model describes an analytical approach to decision-making whilst the intuitive humanistic model presents a wholly intuitive approach. Intuitive processes are recognised in both IPT and the intuitive humanistic model but are represented differently by pattern recognition and intuition respectively. Furthermore, Benner (1984) identified that the intuitive humanistic model did not fully represent nurse decision making and found that expert nurses were not exclusive in their use of intuition but adopted analytical processes in situations which were unfamiliar or in unexpected circumstances. Understanding clinical reasoning processes is fundamental to reducing error and enabling a consistent approach to be taught to clinicians (Croskerry, 2009c) and although both IPT and the intuitive humanistic model offer valuable insights, viewing each in isolation may not fully explain the extent of nurse decision-making (Thompson, 1999).

1.8 Medical decision making

The hypothetico-deductive model dominates medical decision-making and is considered essential to medical diagnosis (Banning, 2008). This model has its roots in IPT but it was noted in studies of medical decision-making that it did not account for the variation in accuracy of diagnosis in clinicians employing this method, and implies that there are other systems which influence the decision-making process. Elstein and Schwarz (2002) recognised that the quality of hypotheses generated was dependent on the experience and knowledge of the physician and was vulnerable to mental short cuts, known as heuristics. Furthermore, experienced physicians were seen to by-pass the deductive process, employing a rapid process of pattern recognition in cases that were familiar and frequently encountered. These shortcuts reduce complex decisions to simpler judgements and are frequently employed in decision-making (Tversky and Kahneman 1975). Heuristics rely on past experience to estimate probability and are prone to bias (Sox, Higgins and Qwens, 2013). There are extensive lists categorising heuristics and biases which include the 'availability' heuristic in which the generation of diagnoses is influenced by the ease at which it comes to mind and 'confirmation bias' in which clinicians seek information to confirm a diagnosis rather than to refute it (Croskerry, 2003). These, alongside pattern recognition, are associated with an intuitive type of decision-making often associated with dual processing theory (Evans 2008) which can be considered a class of IPT (Stanovich, 2019).

Dual processing theory can be applied to medical decision-making and explains how a combination of both analytical and intuitive processes can be used to solve problems and make

medical diagnoses (Brush, Sherbino and Norman, 2017). It distinguishes between cognitive processes that are quick, automatic and intuitive such as pattern recognition known as Type 1 and those which are slow and analytical known as Type 2 (Evans 2008). Furthermore, Type 1 processes can only develop through prior Type 2 learning (Croskerry, 2009c). Croskerry (2009c) presented a dual process model of reasoning which shows the interplay of these two systems and acknowledges the presence of additional Type 1 processes that may be triggered alongside initial pattern recognition such as heuristics and intuition. Determinants of these Type 1 processes are shown in the upper yellow box in Figure 1. Similarly, factors affecting Type 2 processes are shown in the lower yellow box.

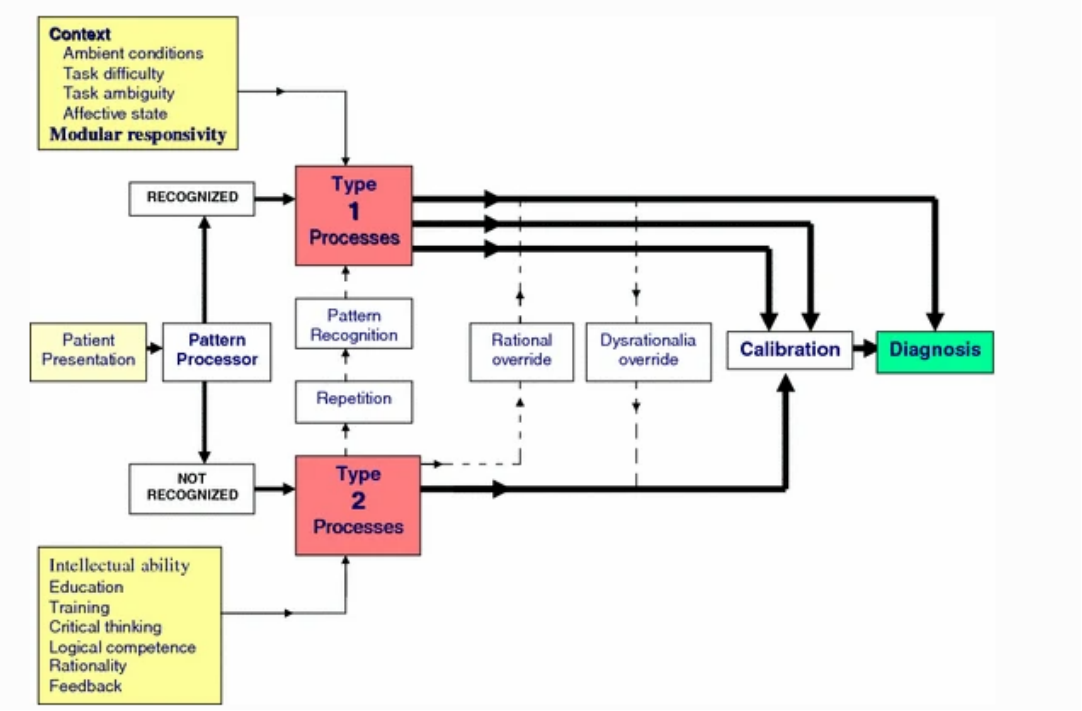


Figure 1 Croskerry's model of diagnostic reasoning

Croskerry (2009a) warned that whilst Type 1 processes may be efficient when applied by experts, they are prone to error which may have catastrophic implications for patients, making their identification in the decision-making process of key importance.

It is clear that analytical and intuitive processes are common to decision-making in both nursing and medicine. Furthermore, there appears to be some difference in the interpretation of intuitive judgement represented by the intuitive humanistic model and IPT. However, it has been shown that neither analytical or intuitive processes in isolation can fully represent the range of processes that inform nursing and medical decision-making. The use of intuitive or Type 1 processes are associated with expert decision-making but are prone to error, whilst analytical processes or Type

2 processes are used in situations where clinicians are less experienced or that are unfamiliar (Croskerry, 2009c). Croskerry's (2009c) dual processing model serves to encompasses processes from both models. The broader understanding of intuitive judgement offered by this model alongside the recognition of the interplay between analytical and intuitive processes makes dual processing theory a convincing model to explain clinical decision-making.

1.9 Complex decision-making

Nurse prescribers are facing increasingly complex decision-making in a society where multi-morbidity (the presence of two or more long-term conditions) and polypharmacy (the taking of multiple medications) are common in adults over the age of 65 (National Institute for Health Care and Excellence, 2015; National Institiute of Health and Care Excellence, 2018b) and account for approximately 53% of GP consultations and 79% of prescriptions (Cassell *et al.*, 2018). Complex decision-making can be considered to be those decisions undertaken for patients with multimorbidity and polypharmacy (Pirret, Neville and La Grow, 2015; National Institiute of Health and Care Excellence, 2018b). Prescribing for patients with polypharmacy is complex and known to be associated with potentially inappropriate prescribing (Bradley *et al.*, 2012) and a cause of frequent error in general practice (Koper *et al.*, 2013). Furthermore, medication-related incidents have been shown to be the main source of unsafe care for older adults in primary care, with errors in clinical-decision contributing to the highest proportion of serious patient harm (Cooper *et al.*, 2017). Difficulty applying evidence-based guidelines, a heightened perception of risk and uncertainty and interacting factors such as age and social situation add to the complexity of decision-making associated with this group of patients (Damarell, Morgan and Tieman, 2020).

Complex decision-making is a defining skill of advanced level NIPs in general practice (Health Education England, 2021); however, it is known that prescribing for patients with polypharmacy and multimorbidity is challenging for these clinicians (Carey, Stenner and Courtenay, 2014); Maddox et al. 2016) with nurses often referring prescribing decisions to a doctor in these circumstances (Carey, Stenner and Courtenay, 2014; Williams *et al.*, 2017; Abuzour, Lewis and Tully, 2018c) For NIPs managing acute illness presentations in primary care, multimorbidity and polypharmacy adds an additional layer of complexity to the diagnostic and prescribing decision-making process. For example, not only are they required to make a new diagnosis, such as community acquired pneumonia, but also to prescribe a new medication in addition to existing polypharmacy with appropriate consideration given to the impact of this new diagnosis and treatment on the patient's existing co-morbidities, social situation and functional abilities. Prescribing for patients with multimorbidity and polypharmacy therefore represents an area of significant risk for nurse prescribers.

1.10 Summary

Nurses in general practice are working in enhanced and advanced roles which include the medical diagnosis and prescribing of medicines for patients presenting with undifferentiated conditions. This is in the context of increasing complexity where multi-morbidity and polypharmacy amongst patients is increasing. Complex decision-making is a core skill of advanced level nurses in general practice and some enhanced level nurses who are undertaking aspects of this role, yet little is known about the decision-making of these nurses in situations of complexity.

Intuitive decision-making with little reliance on analytical processes is associated with expert practice in nursing (Benner, 1984) However, reliance on intuitive processes informed by nursing experience to inform diagnostic and prescribing decisions in situations of complexity may be inappropriate and unsafe. General practice nurses who evolve into enhanced and advanced roles are usually considered expert in general practice nursing; however, the medical aspect of these roles may require re-evaluation of this status and render them novices in this aspect of their role (Brook and Rushforth, 2011). Recognition of the implications this may have on the decision-making processes of this group of NIPs for whom there is no mandate regarding training for this role is therefore vital.

Lack of standardisation regarding job title, role definition and training has resulted in inconsistencies in the level of practice delivered by nurses in general practice. It is apparent that within the general practice workforce there exists a group of nurse prescribers who are required to make autonomous, complex decisions for patients presenting acutely with undifferentiated and undiagnosed conditions who may not be identifiable by their job title and whose skills have developed through diverse experience and training. There is therefore a need for a study to gain understanding of how these nurses make decisions in situations of complexity, which will characterise the skills of this group of practitioners and analyse their decision-making processes. This will allow valuable insight into the training, development and support required for this role and has potential to maximise their effectiveness, improve patient experience, inform training for future prescribers and raise the profile of this important group of nurse prescribers.

1.11 Overview of study

Chapter one has presented the rationale for this study and has given an insight into my clinical and educational background which prompted the research question. It has provided an overview of general practice nursing including the development of the role of NIPs in this setting. Decision-

making theory has been considered and the challenges of decision-making in complex, acute presentations for NIPs in general practice has been discussed.

Chapter two will critically appraise the existing literature that investigates the decision-making processes of nurse prescribers and will also include a review of the influences on these processes. This review will also consider the methods used by researchers investigating this area. This chapter reveals the limited research in this area, in particular in relation to general practice nurse prescribers, and highlights the need for further research.

Chapter three will detail the methodological approach used in this study. It will justify the use of think aloud and vignettes and discuss the process of development and the novel use of staged vignettes to enable detailed exploration of nurse prescribers' decision-making processes in complex situations. It will also describe the methods of data collection and analysis and will consider issues of research governance.

Chapter four will present the findings from the think aloud in response to the vignettes and from semi-structured interviews which were used to further explore participants' decision-making.

Chapter five will discuss the findings of this study and nurse prescribers' decision-making processes will be characterised and explained in the context of existing literature and theories. Implications for future practice of nurse prescribers and education will be considered, and recommendations made for further research. This chapter will also consider reflexivity and the strengths and limitations of this study.

Chapter 2 Literature review

2.1 Introduction to chapter

The purpose of this review is to critically appraise the literature on the decision-making of nurse independent prescribers'(NIPs). It will establish what is already known about how these nurses make decisions and the associated cognitive processes involved, with a particular focus on decision-making in situations of complexity. The review will also aim to gain an understanding of the research methods used to investigate decision-making.

Initial searching of the literature revealed a large body of literature surrounding nurse decision-making but very few studies that specifically explore the decision-making of nurse prescribers. Differentiating nurse prescribers is important as their role requires not only the prescribing of medicines but also medical diagnosis. These practitioners represent a unique subset of nurses for whom acquisition of these skills, which are traditionally considered in the medical domain, requires completion of post-registration qualification and training and differs fundamentally from medical preparation for these skills (Pirret, 2016).

2.2 Search process

A systematic search of nursing and medical bibliographic databases was undertaken to identify key research papers. These papers are critically reviewed in this chapter. Early scoping searches revealed few studies that investigated the decision-making processes of nurse prescribers. The search terms were therefore revised to include other nurses whose roles include medical diagnosis and treatment decisions who may not necessarily be prescribers but whose roles are similar to that of NIPs. Over the years the term 'nurse practitioner' has been used to represent nurses who have expanded their practice to include skills traditionally in the medical domain such as medical diagnosis but not necessarily the prescribing of medicines (Royal College of Nursing, 2005) and therefore this was adopted as an additional search term alongside 'advanced practitioner' and is reflective of the range of terminology used to describe this group of nurse prescribers in general practice (Leary *et al.*, 2017; Health Education England, 2021). It was decided not to limit the search by considering only decision-making in situations of complexity due to the limited amount of published literature in this area and, furthermore, studies giving valuable insight into the decision-making of this group of nurses may be missed.

Search terms were established and are represented in Table 1 below.

Table 1 Search terms

Database	CINAHL	Medline	PsycINFO	Embase
Search term	Nurse prescrib* OR non medical prescrib* OR Independent nurse prescrib* OR nurse practitioner* OR advanced practitioner*	Nurse prescrib* OR non medical prescrib* OR Independent nurse prescrib* OR nurse practitioner* OR advanced practitioner*	Nurse prescrib* OR non medical prescrib* OR Independent nurse prescrib* OR nurse practitioner* OR advanced practitioner*	Nurse prescrib* OR non medical prescrib* OR Independent nurse prescrib* OR nurse practitioner* OR advanced practitioner*
	Decision making clinical (major concept) OR diagnostic reasoning (major concept)	Decision making clinical (major concept) OR diagnostic reasoning	Decision making (major concept) OR Diagnostic reasoning	Clinical decision making (major term) OR diagnostic reasoning (major term)

Search limiters were established with a date restriction of research published after 1980. This date represents the start of the nurse practitioner movement in the UK (Royal College of Nursing, 2008). Global literature was used to capture a wide range of literature and maximise understanding of nurse practitioners’ and nurse prescribers’ decision-making.

The search process is represented in Table 2 below. The use of Boolean operator ‘AND’ is used to combine search terms and results recorded.

Table 2 Combined search terms and results

	Nurse prescrib* OR non medical prescrib* OR Independent nurse prescrib* OR nurse practitioner* OR advanced practitioner*	Decision making OR diagnostic reasoning	AND
CINAHL	51,700	15,446	416
MEDLINE	24,232	5,477	54
PsycINFO	12,468	66,548	264
EMBASE	32,590	7,584	42

Inclusion and exclusion criteria were established and represented in Table 3

Table 3 Inclusion and exclusion criteria

Inclusion	Exclusion
Nurse prescriber or practitioner role	Other nursing roles, or studies including other professions where findings relating to nurse prescribers or practitioners cannot be clearly differentiated.
Relates to diagnostic or prescribing/treatment decision-making	Other decision making. Studies testing effects of interventions on decision-making.
Research papers	Non-research articles eg editorials or opinion pieces.

After application of inclusion/exclusion criteria 21 papers were identified for review.

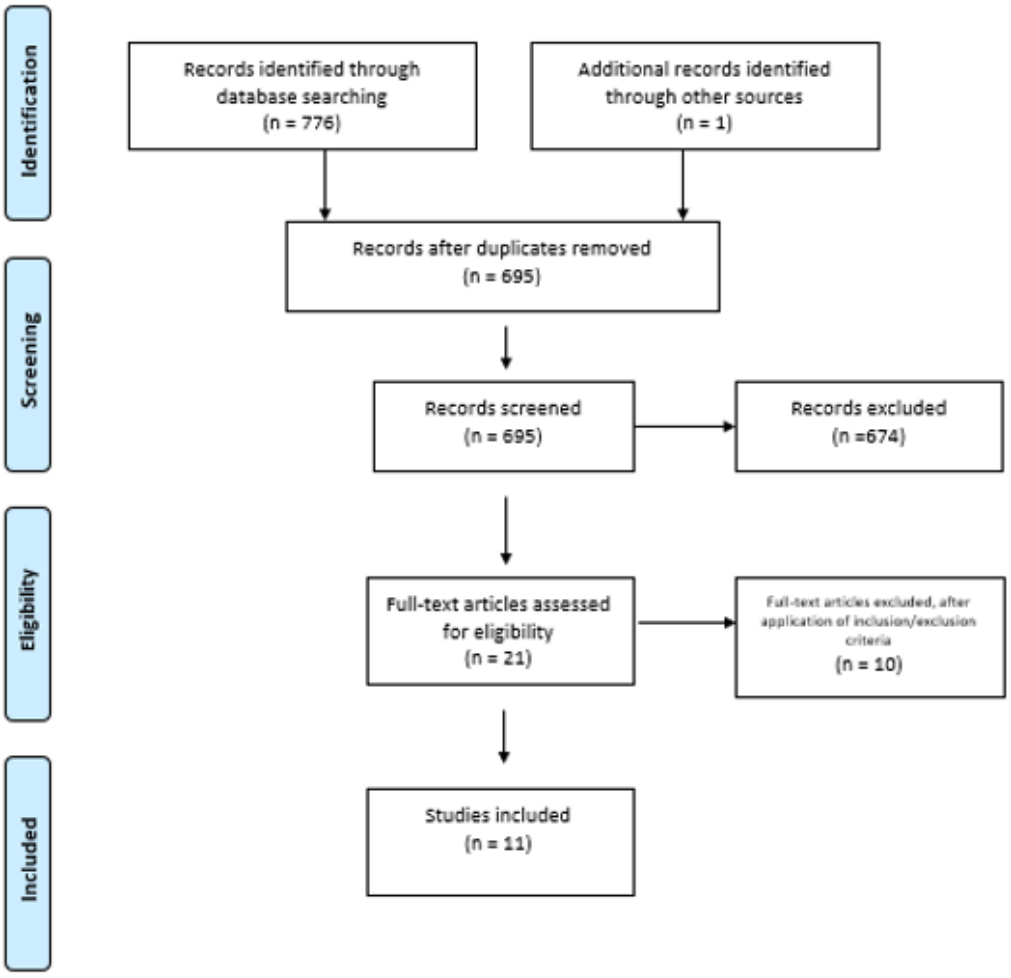
Full text of the 21 papers were reviewed for relevance and narrowed further to 11 papers. These are shown in Table 4 below.

Table 4 Search results: decision-making processes

Decision making processes
Abuzour AS, Lewis, PJ and Tully MP (2018) A qualitative study exploring how pharmacist and nurse independent prescribers make clinical decisions', Journal Of Advanced Nursing 74(1): 65-74
Burman ME, Stepans MB, Jansa N and Steiner S (2002) How do NPs make clinical decisions? *The Nurse Practitioner* 27(5): 57-64
Marsden J (1999) Expert nurse decision-making: Telephone triage in an ophthalmic accident and emergency department. *NT Research* 4(1): 44-52
Offredy M (1998) The application of decision making concepts by nurse practitioners in general practice. *Journal of Advanced Nursing* 28(5): 988-1000
Offredy M (2002) Decision-making in primary care: outcomes from a study using patient scenarios. *J Adv Nurs* 40(5): 532-41
Offredy M, Kendall S and Goodman C (2008) The use of cognitive continuum theory and patient scenarios to explore nurse prescribers' pharmacological knowledge and decision-making. *Int J Nurs Stud* 45(6): 855-68
Pirret AM (2016) Nurse practitioners' versus physicians' diagnostic reasoning style and use of maxims: A Comparative Study. *Journal for Nurse Practitioners* 12(6): 381-389
Pirret AM, Neville SJ and La Grow SJ (2015) Nurse practitioners versus doctors diagnostic reasoning in a complex case presentation to an acute tertiary hospital: A comparative study. *International Journal of Nursing Studies* 52(3): 716-726
Ritter BJ (2003) An analysis of expert nurse practitioners' diagnostic reasoning. *J Am Acad Nurse Pract* 15(3): 137-41
Rosciano A, Lindell D, Bryer J and DiMarco M (2016) Nurse practitioners' use of intuition. *The Journal for Nurse Practitioners* 12(8): 560-56
Thompson S, Moorley C and Barratt J (2017) A comparative study on the clinical decision-making processes of nurse practitioners vs. medical doctors using scenarios in a secondary care environment. *Journal of Advanced Nursing* 73(5): 1097

The search process is represented in the PRISMA flowchart in Figure 1 below

Figure 1 PRISMA flowchart to show search strategy



During the search process it was noted when reading the full text of the selected papers that several included findings relating to influences on NP decision-making (Offredy, 1998; Offredy, Kendall and Goodman, 2008; Pirret, Neville and La Grow, 2015; Abuzour, Lewis and Tully, 2018c). Moreover, three additional papers were identified whose focus was solely on the influences on the decision-making processes. Understanding influences on NP decision-making is important as these can impact the cognitive processes of NPs (Croskerry *et al.*, 2017). To ensure that all relevant studies were identified an additional search was undertaken across all four databases to identify any additional papers studying influences on NIP decision-making.

Search terms were identified and combined as shown in Table 5 below. Due to the wider body of literature relating to influences on nurse prescriber decision-making the search terms were limited to represent those with a nurse prescriber qualification. As in the previous search global literature was included to maximise understanding of this area.

Table 5 Combination of search terms and results for influences on prescribing

	Nurse prescrib* OR non medical prescrib* OR independent nurse prescrib*	Decision making	Influence*	Combined with Boolean operator AND
CINAHL	9,801	168,166	287,618	114
MEDLINE	734	226,351	1,345,996	16
PsycINFO	3,423	158,890	540,796	41
EMBASE	1137	504,735	1,827,421	27

Inclusion and exclusion criteria were applied (Appendix A.1) to ensure that selected papers reflected those in which findings related to nurse prescribers could be clearly distinguished from other prescribers, studies related directly to influences on nurse prescriber decision-making and research papers only.

After application of inclusion/exclusion criteria eight papers were identified for review. After revision of the full text, five papers were considered relevant and appropriate to include in the review. These are shown in Table 6 below.

Table 6 Results from search on influences on decision-making

Abuzour AS, Lewis PJ and Tully MP (2018) Factors influencing secondary care pharmacist and nurse independent prescribers' clinical reasoning: An interprofessional analysis. *Journal of Interprofessional Care* 32(2): 160-168

Djerbib A (2018) *A qualitative systematic review of the factors that influence prescribing decisions by nurse independent prescribers in primary care*. RCN Publishing Company Limited

McIntosh T, Stewart D, Forbes-McKay K, McCaig D and Cunningham S (2016) Influences on prescribing decision-making among non-medical prescribers in the United Kingdom: systematic review. *Fam Pract* 33(6): 572-579

Ness, V. *et al.* (2016) 'Influences on nurse prescribers' antimicrobial prescribing behaviour : a systematic review', *Journal of Clinical Nursing*, 25, pp. 1206-1217

Williams, S.J. *et al.* (2017) 'General practitioner and nurse prescriber experiences of prescribing antibiotics for respiratory tract infections in UK primary care out-of-hours services (the UNITE study)', *The Journal of Antimicrobial Chemotherapy*.

A prisma flowchart representing the search process can be found in Appendix A.2.

Articles from both searches were reviewed in detail using the CASP tool appropriate to the research method (CASP UK, 2018). These tools provide useful initial screening questions to make an initial judgement on the quality of the research and then were used as a basis for the more detailed review to underpin the literature review. A summary table of data extraction from the papers relating to both decision-making process and influences can be found in Appendix B.

2.3 Review of studies

This review will first look at the methods used in the studies to explore decision-making processes and influences on decision-making. This was undertaken to inform the methods that were used in this study. Discussion of participants in all studies will be considered first. This will be followed by a review of the methods used to study decision-making processes and then the methods used to study influences. The findings of the studies will then be reviewed in detail.

2.4 Participants

All studies included participants who were nurse practitioners (NPs). Where other clinicians were included in the studies, findings that were particular to NPs could be differentiated. The NP title does not represent a universal qualification and the educational preparation and prescribing status of nurse practitioners varies not only across the UK but similarly worldwide (Leary *et al.*, 2017). However, all were in a role that required them to make diagnosis and treatment decisions.

2.4.1 Participants: UK studies

Ten of the sixteen studies were UK based and included both primary and secondary care NPs with varied qualifications. There is currently no regulation of the nurse practitioner title in the UK and it is therefore difficult to be certain of the scope of practice inferred by this title (Leary *et al.*, 2017). Within the studies not all of the participating nurse practitioners were prescribers but were in roles that required them to make medical diagnosis and plans for treatment.

There was a wide date range amongst the UK studies, consequently some nurse prescribers were working to a restricted formulary (Offredy, 1998; Marsden, 1999; Offredy, 2002; Offredy, Kendall and Goodman, 2008; McIntosh *et al.*, 2016; Djerbib, 2018). This restricted formulary, which was replaced in 2006 to give nurse prescribers extensive prescribing rights, limited nurse prescribers to 250 prescription-only drugs applied to a limited range of conditions which excluded prescribing for some chronic diseases (Courtenay, Carey and Burke, 2007). As such, their experience and knowledge of prescribing differed to that of current nurse prescribers. This is important when

considering the transferability of these findings and is particularly relevant when applied to general practice nurse prescribers who unlike many secondary care nurse prescribers do not generally have formulary restrictions imposed on them by their employers (Bowskill, Timmons and James, 2013). Moreover, this may have implications for the transferability of findings to decision-making in situations of complexity in which chronic diseases are commonplace.

2.4.2 Participants: International studies

Of the remaining studies three were from the US (Burman *et al.*, 2002; Ritter, 2003; Rosciano *et al.*, 2016)and two from New Zealand (Pirret, Neville and La Grow, 2015; Pirret, 2016) whilst Ness *et al's* (2016) systematic review included mostly studies from US.

The majority of nurse practitioners in the US have graduate degrees and over 95% prescribe medications (American Association of Nurse Practitioners, 2019); however the level of autonomy varies across states although there is a progressive move towards allowing nurse practitioners full autonomy (Carlson, 2017). Within the US studies educational qualifications were mixed, although Rosciano *et al.* (2016) and Ritter (2003) specify all participants had master's level qualification. It is unclear regarding the level of autonomy amongst participants with the exception of Rosciano *et al.* (2016) who recruited participants from New York state which is known to have a restricted level of autonomy for nurse practitioners.

The role of the nurse practitioner is more clearly defined in New Zealand with the nurse practitioner title being legally protected. These nurses are required to have a Master's degree and undergo a process of assessment (Pirret, 2016). The variation in prescribing practice and educational qualifications within and across countries needs to be considered when reviewing the literature on the decision making of nurse practitioners. Similarly, the setting in which the studies were undertaken was varied, with just over half of the studies set in primary care and the remainder in secondary and one study recruiting participants from both.

Overall, there is a vast difference in the experience, qualifications, prescribing authority and autonomy of the participants in the studies who work in different settings across primary and secondary care. Although undertaking similar roles, those with limited formularies and autonomy may behave differently when making diagnostic decisions and treating patients and may not be experiencing the breadth and complexity encountered by prescribers whose scope of practice and potential for prescribing are broader. Similarly, the educational background of participating nurse practitioners may affect their ability for critical thinking and management of complex scenarios. Despite this, all participants were in roles which required them to make assessment and treatment decisions for their patients so there is value in their inclusion, but these factors will

need careful consideration when interpreting the findings from the studies and considering their transferability to other settings.

2.5 Methods

2.5.1 Methods used to explore decision-making processes.

This section will focus on studies whose primary aim was to investigate decision-making processes.

2.5.1.1 Data collection and theoretical frameworks

Table 7 below shows the range of data collection methods and theoretical frameworks used within the studies. The majority of studies used qualitative methods of data collection, whilst two studies used a quantitative approach to data collection. Semi-structured interviews were used in all of the qualitative studies but only as the sole method in one (Burman *et al.*, 2002). Vignettes were commonly used to replicate the clinical encounter and think aloud was used alongside vignettes to allow concurrent verbalisation in five of the studies. These methods will be critically considered later in the chapter.

Table 7 Data collection and theoretical frameworks used in the studies

Data collection method	**Studies**	**Theoretical framework**
Vignettes, think aloud, semi-structured interviews	Abuzour, Lewis and Tully (2018c)	Information processing theory
	Thompson, Moorley and Barratt (2017)	Information processing theory Marshall's schema theory
	Pirret, Neville and La Grow (2015) (no interview)	Dual processing theory
	Ritter (2003)	Information processing model, hermeneutic model
	Offredy (2002)	Information processing theory, schema theory
Vignettes and semi-structured interviews	Offredy, Kendall and Goodman (2008) Burman *et al.* (2002)	Hammonds cognitive continuum theory Hypothesis testing, pattern matching, schema theory, intuition
Semi-structured interviews	Marsden (1999) (in response to telephone encounters)	Hypothetico-deductive, intuition
Observation and semi-structured interviews (retrospective verbalisation)	Offredy (1998)	Hypothetico-deductive, decision analysis, pattern recognition, intuition
Survey - questionnaires	Pirret (2016) Rosciano *et al.* (2016)	Dual processing theory Intuitive-humanistic model

2.5.1.2 Theoretical frameworks

The theoretical frameworks adopted by the studies will have significant influence on the methods adopted by the study. This is particularly true of those studies driven by theory and less so of those adopting a grounded theory approach (Burman *et al.*, 2002; Abuzour, Lewis and Tully, 2018a;c) where theory is used solely to interpret the findings (Grbich, 1999).

Two main descriptive theories have been discussed as dominating clinical decision making in nursing, namely information processing theory (IPT) and the intuitive-humanist model (Banning, 2008) as exemplified by Benner (1984), and they are reflected in the theoretical frameworks used

in the studies. To understand decision-making in the context of IPT, access is required into participants' cognitive processes. 'Think aloud' as a method of data collection is a recognised data collection tool used to identify cognitive processes within this theoretical framework (Ericsson and Simon, 1984), whilst the intuitive-humanist model requires an interpretive approach and uses methods such as observation and interviews to gain a narrative account of decision-making (Benner, 1984).

The majority of studies were underpinned by IPT. This theory can be seen to incorporate models and concepts such as the hypothetico-deductive model, pattern matching and schema theory. Similarly Pirret (2016) and Pirret, Neville and La Grow (2015) used dual processing theory as their theoretical framework which can be considered a class of IPT (Stanovich, 2019). Offredy, Kendall and Goodman (2008) used Hammond's cognitive continuum model, based on principles of dual processing theory where cognitive processes can be mapped along a continuum and correspond to features of the task (Hammond, 1996). Four studies looked at both IPT and Benner's (1984) intuitive model (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003) whilst one study looked solely at the intuitive model (Rosciano *et al.*, 2016). The application of different theoretical frameworks to these studies has implications for the methods used and may necessitate a combined approach to allow testing of both theories.

2.5.1.3 Qualitative methods of data collection

Qualitative methods were most frequently adopted by researchers. Such methods aim to develop and discover new theories rather than test what is already known Flick (1998) and give the opportunity to develop new understanding.

2.5.1.3.1 Think aloud

Think aloud was used in response to vignettes in five of the studies (Offredy, 2002; Ritter, 2003; Pirret, Neville and La Grow, 2015; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). Think aloud as a method for data collection is underpinned by IPT (Fonteyn, Kuipers and Grobe, 1993) and produces concurrent reports of cognitive processes believed to closely reflect an individual's cognitive processes (Ericsson and Simon, 1984). Vignettes are short fictitious case studies based on real life scenarios used to pose questions to the reader to elicit a response (Veloski *et al.*, 2005). Four of the studies adopted IPT as a theoretical framework and the use of think aloud is therefore likely to yield more valuable and valid insights into participants' decision-making processes than data from interviews in which participants are asked to retrospectively report on their decision-making.

Ritter (2003) used Benner's (1984) intuitive model in addition to IPT to interpret the findings. Semi-structured interviews were used in addition to think aloud to give the opportunity to explore this aspect of decision-making where features of intuitive responses to decision-making may not be accessible through protocol analysis alone (Ritter, 2003).

Pirret, Neville and La Grow (2015) used think aloud for data collection. Dual processing theory was used as the theoretical framework in this study. Dual-processing theory can be considered to be encompassed within IPT (Stanovich, 2019) and shares aspects of deductive reasoning and pattern recognition which supports the use of this method.

2.5.1.3.2 Semi-structured interviews

The use of semi-structured interviews relies on retrospective recall of participants' decision-making and is therefore prone to bias and may not accurately represent participants' thought processes (Ericsson and Simon, 1984). These were used in eight of the studies to explore decision-making in response to scenarios or patient encounters. Despite their limitations, semi-structured interviews have considerable value when used in addition to think aloud for the purpose of exploration and clarification of participants' decision-making (Fonteyn, Kuipers and Grobe, 1993). Furthermore, for studies which considered theoretical frameworks other than IPT, interviews may be an important method to capture features that may not be identifiable from concurrent verbal reports.

2.5.1.4 Quantitative methods of data collection

Two of the studies used purely quantitative methods of data collection (Pirret, 2016; Rosciano *et al.*, 2016). These studies used validated surveys and questionnaires to elicit statistical data in order to analyse the cognitive processes used by participants. A range of questionnaires was utilised to capture specific theoretical frameworks used in the studies. Participants were asked to rate or identify aspects of their decision-making within questionnaires. These studies did not seek to generate new theory but rather to investigate the adoption of existing theoretical viewpoints.

Statistical analysis was used to represent the decision-making processes of participants. A weakness of this approach is the reliance of self-reported data and the risk of bias in the response of participants who may not fully understand the concepts behind the questions or may alter their response to present what they perceive as a favourable impression of themselves (Rosenman, Tennekoon and Hill, 2011). There is also some question regarding the accuracy of retrospective accounts in representing the cognitive processes involved in decision-making (Ericsson and Simon, 1984). Furthermore Pirret's (2016)study which compared the diagnostic reasoning styles

of doctors and NPs was underpowered to detect differences between the two groups and therefore was at risk of a Type 2 error.

2.5.1.5 Vignettes

Offredy (1998) used direct observation and retrospective verbalisation to investigate participants' decision-making. This was is in contrast to the majority of the remaining studies which used methods that replicated the patient encounter, of which vignettes (also referred to as patient scenarios) were the most common and were adopted by six of the studies (Burman *et al.*, 2002; Offredy, 2002; Ritter, 2003; Offredy, Kendall and Goodman, 2008; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). Vignettes are commonly adopted in studies investigating decision-making to overcome many of the ethical and practical difficulties of observation and allow the control of external factors which may compromise internal validity in the clinical setting (Veloski *et al.*, 2005). Additionally they are considered to elicit responses comparable to those in response to real life scenarios (Evans *et al.*, 2015). Although Offredy (1998) used observation of actual patient encounters which enabled the researchers to triangulate data from their observations with the data from verbalisation, the participants were required to recall their decision-making over the entirety of their clinic during a semi-structured interview. This represented a time frame of up to three hours from the first patient for some participants and produced retrospective data which may not accurately reflect cognitive processes (Ericsson and Simon, 1984). This highlights some of the practical difficulties of investigating decision-making in the 'real world' setting where concurrent verbalisation would be disruptive to the consultation, risk introducing bias and present ethical challenges (Veloski *et al.*, 2005) . Offredy and Meerabeau (2005) argued that it would be ethically unsound from the perspective of the patient to ask a practitioner to verbalise their thoughts whilst undertaking a patient assessment. A later feasibility study to test the use of vignettes in the investigation of prescribing decisions by nurses was undertaken by Offredy, Kendall and Goodman (2008). They identified advantages of vignettes in their ability to allow standardisation and control of the presenting case and also in offering the potential to be devised to replicate real-life scenarios in an inexpensive form. However, it was also recognised that they lack contextual, subtle signs that may influence decision making. Similarly Marsden (1999) attempted replication of the real world setting by using actual telephone triage consultations to generate scenarios to investigate the decision making of participants. Interviews were used that took place shortly after the telephone encounters for data collection, however, similar to Offredy (1998), this relied on recalling patient encounters and may not accurately represent cognitive processes.

Table 8 below shows the construction and characteristics of the vignettes used in the studies.

Table 8 Construction and characteristics of vignettes

Study	Vignette construction	Comments
Abuzour, Lewis and Tully (2018c) Abuzour, Lewis and Tully (2018a)	3 vignettes. Taken from validated exam scenarios. Basic information in vignettes, contextual details omitted. Single stage vignettes	Participants could choose the clinical area for the scenario ensuring focus on decision-making processes. Basic vignettes may lack important factors that influence decision-making. No requirement to request data.
Thompson, Moorley and Barratt (2017)	Single scenario in participants' speciality. Scenarios reflected the diagnosis and clinical manifestations of the condition. Single stage. Open-ended questions about how they would proceed. No limit to the amount of information that could be asked for. Adapted from scenarios validated from another study.	Initial information in the vignette is quite comprehensive and includes social history although not entirely clear. Participants were not required to request initial information and may not have requested all the data presented. Reference model used for comparison.
Pirret, Neville and La Grow (2015)	Single complex scenario Segmented data presented using computer programme, each segment representing clinical data presented one at a time (23 in total). Participants choose the order and rate in which the segments are reviewed	Participants not required to request information and may not have accessed all the data presented to them.
Offredy, Kendall and Goodman (2008)	4 validated scenarios. Short prescribing scenarios, participants asked how they would proceed. Single stage vignette.	Difficult to assess which content was think aloud and which was interview. Rating scheme to test knowledge.
Ritter (2003)	2 complex validated vignettes Single stage.	Comprehensive content of complex vignette. Validated by expert NPs for appropriate complexity. No requirement to request information
Offredy (2002)	6 scenarios chosen from NP caseload by 2 NPs and a GP.	Reference model with critical and relevant cues.

	Participants required to request information and verbalise thoughts. No restriction on requesting data.	No vignette example given but vignettes in Thompson's study adapted from these, so likely initial information was comprehensive.
Burman *et al.* (2002)	2 vignettes representing standard primary care. Basic subjective and objective information. Single stage.	No requirement to request information.

Within the studies the content of the vignettes varied. Both studies by Abuzour (2017, 2018) supplied basic information only, with the assumption that this would aid the think aloud process and facilitate access to the cognitive processes of decision-making. Others supplied more detail, for example Pirret, Neville and La Grow (2015) used a single complex scenario but divided the information into 23 segments. Thompson, Moorley and Barratt (2017) and Offredy (2002) gave the opportunity for participants to request individual information but the initial vignette gave a comprehensive outline of the scenario. A weakness therefore in all the studies using these vignettes is their failure to fully investigate the information the participants would have chosen to request about the scenario, a factor that was identified by Pirret, Neville and La Grow (2015) as a limitation of their study. This is of particular importance when investigating decision-making for a complex case as represented in this study, where awareness of the content and breadth of information needed is vital in the assessment process (Pirret, Neville and La Grow, 2015).

2.5.1.6 Summary of data collection methods

In summary, theoretical frameworks impact on the data collection method for the studies. Think aloud is a valuable data collection tool within the IPT framework. Vignettes overcome many of the problems associated with direct observation and in addition to think aloud and explanatory interviews may provide a near complete representation of an individual's decision-making (Fonteyn, Kuipers and Grobe, 1993). The combination of think aloud and semi-structured interviews avoids the potential recall bias of retrospective data from semi-structured interviews alone. Direct observation of decision-making presents ethical and practical challenges making vignettes a valuable data collection tool. It is however important that vignettes should be devised

to represent as accurately as possible actual patient scenarios to maximise internal validity (Hughes and Huby, 2012). A limitation of vignettes lies in their inability to convey subtle signs such as smell, emotion or contextual influences on decision-making (Benner, Tanner and Chelsa, 1996; Offredy, Kendall and Goodman, 2008; Abuzour, Lewis and Tully, 2018c). This is important when attempting to identify the intuitive decision-making described in the Benner's intuitive humanistic model (Benner, 1984) which relies in part on the context of the particular situation and the nurse's emotional response and interaction with the patient and supports the use of interviews or quantitative data in the form of questionnaires to capture this form of decision-making.

Within all the studies there was a limited requirement within the vignettes for participants to request information regarding the patients' presentation. This is an important limitation in all the studies, and has particular relevance for complex scenarios where the information collected or omitted by participants may have considerable impact on the safety of participants' decision-making (Pirret, Neville and La Grow, 2015). This highlights an area for future research in which vignettes are developed which require participants to request information.

Those studies that used quantitative methods for data collection in this review relied on self-reported data and the ability of participants to accurately recall aspects of their decision-making processes and fully understand the concepts being investigated. These methods do not allow for the exploration of new theory or models of decision-making.

2.5.1.7 Data analysis

The analysis of studies examining decision-making processes is complex due to the different theoretical viewpoints of researchers and warrants detailed review.

2.5.1.7.1 Qualitative studies

Table 9 below represents the methods of data analysis for all qualitative studies.

Table 9 Data analysis methods for qualitative studies

QUALITATIVE STUDIES			
Study	**Data analysis**	**Theoretical framework**	**Comments**
Abuzour, Lewis and Tully (2018c)	Constant comparative approach, generation of codes and themes.	Information processing theory (IPT) .	Grounded theory.
Thompson, Moorley and Barratt (2017)	Protocol analysis: data from think aloud coded into 9 themes and divided into diagnostic and therapeutic themes. Reference model used to evaluate cues. Thematic analysis of semi-structured interviews.	IPT, Marshall's Schema theory.	No triangulation of data.
Offredy, Kendall and Goodman (2008)	Content analysis – coding using computer software. Hammond's cognitive continuum theory used to identify the type of cognition. Rating scheme to identify correct responses (descriptive statistics) and self-reported knowledge.	Hammond's cognitive continuum theory.	Methods not clearly explained. Participants asked to make judgements outside of their scope of practice and without access to usual resources.
Ritter (2003)	Content analysis – coding from components of IPT and hermeneutical model	Information processing model, Hermeneutic model	Pattern recognition could be considered attributable to both models
Burman *et al.* (2002)	Simultaneous data collection and analysis. Comparative analysis, descriptive codes and categories.	Hypothesis testing, pattern matching model, schema theory, intuition.	Grounded theory.
Offredy (2002)	Coding reflecting diagnostic and therapeutic decision-making. Cognitive: 4 stage reasoning. Therapeutic	IPT Marshall's schema theory.	It is not entirely clear how the data comparing cues from the reference model between NPs and GOs were analysed.

	5 stages: diagnosis, treatment, advice, further treatment, refer GP. Further subdivisions. Computer software used. Reference model to identify critical and relevant cues.		Descriptive statistics were incorporated into the discussion section.
Marsden (1999)	Iterative, cyclical thematic analysis.	Hypothetico-deductive, intuition.	
Offredy (1998)	Content analysis, coding based on emerging themes.	Hypothetico-deductive, decision, analysis pattern recognition, intuition.	Pattern recognition and intuition differentiated by level of conscious application. Pattern recognition – conscious, intuition – unconscious.

Nearly all studies used themes and codes to identify decision-making processes. These were either informed or interpreted by the theoretical framework adopted by the researchers.

2.5.1.7.2 Think aloud data analysis

Ericsson and Simon (1984) gave detailed recommendations for protocol analysis (the analysis of verbal reports) relevant to those studies adopting IPT as the underpinning theoretical framework (Offredy, 2002; Ritter, 2003; Pirret, Neville and La Grow, 2015; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). It is difficult to know to what extent the detail of this system was observed by the studies as insufficient detail is given, but it appears that a simplified version was used, with coding categories derived from key components of IPT. Ritter (2003) also used data from Think aloud to identify components of the Benner's intuitive model (Benner, Tanner and Chelsa, 1996). This deviates from the theoretical basis of protocol analysis and whilst some aspects such as 'gathering data related to hypothesis' can reasonably be expected to be identified, others such as 'skilled know how' are more difficult to identify in this way. The authors included semi-structured interviews to allow this information to be accessed and coding was similarly applied to this data.

2.5.1.7.3 Analysis of semi-structured interviews

Thematic analysis and coding were used for data analysis. This was either in combination with think aloud data (Ritter, 2003; Offredy, Kendall and Goodman, 2008; Thompson, Moorley and

Barratt, 2017; Abuzour, Lewis and Tully, 2018c) to allow further exploration of verbal data or cognitive processes, or as the sole source of data (Marsden, 1999; Burman *et al.*, 2002). Offredy, Kendall and Goodman (2008) used content analysis and Hammond's cognitive continuum theory to interpret data from interviews.

2.5.1.7.4 Assessment of responses to scenarios

Three studies used either a rating scale (Offredy, Kendall and Goodman, 2008) or reference model (Offredy, 2002; Thompson, Moorley and Barratt, 2017) to assess the appropriateness of participant responses or number of cues collected by participants. Although these produced only descriptive statistics they enabled the authors to make some judgement regarding the effectiveness of the decision-making processes revealed during the research. Although inferences outside of these studies cannot be made from these statistics, they added depth to the understanding of decision making processes of the study participants; however, this is only useful when the study is well constructed (Tappen, 2011). Offredy, Kendall and Goodman (2008) asked nurse practitioners to make prescribing decisions outside of their scope of practice and without access to usual resources which may invalidate these findings.

2.5.1.7.5 Quantitative studies

All quantitative studies used statistical analysis programmes to analyse data. This enabled the analysis of nurse practitioners' decision-making within pre-determined theoretical frameworks and the identification of commonly occurring processes (Rosciano *et al.*, 2016). Pirret (2016) used statistical analysis to identify and compare decision-making processes between nurse practitioners and GPs and included the time taken to complete the vignettes in their results.

Notably the study by Pirret, Neville and La Grow (2015) used mixed methods and quantfied qualitative data from think aloud by coding the data informed by IPT and attributing numerical values to the codes. Quantitative data analysis was chosen by the authors as they believed this would produce more credible results which were needed to support future workforce planning. The codes used in the study were informed by Elstein *et al.* (1993) and were based on aspects of the hypothetico-deductive model which has its basis in IPT. The authors applied dual processing theory to the analysis of data, and whilst the codes were used to capture the analytical, Type 2, aspect of this theory, the intuitive Type 1 reasoning aspect of this model was accounted for only by the time taken to complete scenarios. The authors found that those with the poorest diagnostic abilities completed the scenario in the quickest time which they concluded indicates the use of an intuitive approach where an analytic approach was needed. Pirret, Neville and La

Grow (2015) used mixed methods and adopted qualitative techniques for data collection from which they quantified the data for analysis to produce statistical results.

2.5.1.8 Summary of methods

This review of methods to explore decision-making has shown the influence of the theoretical framework on the research methods. Theoretical frameworks underpin the methods of data collection and analysis, with the exception of grounded theory studies where they are used only as a guide to data interpretation (Grbich, 1999).

The difficulty of investigating decision-making processes in real-life scenarios in practical and ethical terms has been highlighted. It has been shown that the use of vignettes can provide a valid alternative to actual patient consultations, and responses to vignettes using think aloud, semi-structured interviews or a combination of methods give valuable and practical options for research into decision-making.

The importance of vignette construction is highlighted, and a weakness of the vignettes used in the studies is their failure to require participants to request information regarding the patient. To varying degrees this information is presented to the participants and therefore overlooks a valuable component of cue acquisition in decision-making. Pirret, Neville and La Grow (2015) recognized this as a key limitation in their study of a complex scenario.

Although the use of quantitative methods allows some insights into the decision-making processes of participants within existing theoretical frameworks, these rely on self-reported data and allow no opportunity to further explain or explore participants' responses.

Data analysis within all the qualitative studies employed systems of coding and thematic analysis which were applied in the context of theoretical frameworks to generate representations and understanding of the decision-making processes of participants. The additional use of reference models and descriptive statistics within three of the studies added a depth of understanding to the interpretation of the data.

This analysis has shown that different theoretical frameworks can be applied to the study of decision-making. The dominant theories are IPT which encompasses dual processing theory and the hypothetico-deductive model, and the intuitive-humanistic model, both of which allow valuable insights into decision-making processes. Identification of theoretical frameworks has important implications for the study methods and interpretation of data.

2.6 Methods used to explore influences on decision-making

2.6.1 Systematic reviews exploring influences on decision-making

All three systematic reviews (McIntosh *et al.*, 2016; Ness *et al.*, 2016; Djerbib, 2018) considered influences on decision-making and were underpinned by robust and transparent methods of literature searching and analysis. Ness *et al.,* 2016 included six international studies and one UK study and focused solely on antimicrobial prescribing whilst the other two reviews comprised UK studies only, but Djerbib (2018) included only primary care prescribers. Although McIntosh *et al.* (2016) had a wider inclusion criteria of primary and secondary UK studies they identified only three studies, two of which only considered antibiotic prescribing. This highlights the broader inclusion of studies by Djerbib (2018) who reviewed ten papers but some were less focused on influences on prescribing decision-making and were more representative of experiences of prescribing decision-making.

Both Djerbib (2018) and McIntosh *et al.* (2016) included only qualitative studies and semi-structured interviews were the main method of data collection whilst Ness *et al.* (2016) included mainly quantitative studies and used surveys as the main data collection tool. The range and focus of papers included in these systematic reviews means that caution is needed when transferring the findings to other settings.

2.6.2 Methods used in other studies on influences on decision-making

Two other studies reviewed influences on decision-making, Williams *et al.* (2017) and Abuzour, Lewis and Tully (2018a). Both used semi-structured interviews however, Abuzour, Lewis and Tully (2018a) used think aloud in response to vignettes in addition to semi-structured interviews. This was part of another study that focused on the decision-making processes of nurse prescribers (Abuzour, Lewis and Tully, 2018c) and although the use of think aloud is predominantly associated with exploring cognitive processes it allowed the authors greater insight into decision-making processes with the potential to reveal influences on decision-making that may not be uncovered during the interviews.

Interviews are the most commonly adopted method to explore influences on decision-making within the studies. Interviews allow participants to reflect on the meaning of past events and researchers to gain understanding of participants' perspectives and understanding, where such information is not easily accessible in any other way (Grbich, 1999). However, interviews yield retrospective data and rely on participants accurately recalling events and are therefore prone to recall bias (Sedgwick, 2014). This can be overcome to some extent by reducing the time between

the decision-making and the interview. The use of vignettes and think aloud in addition to interviews is beneficial in allowing control of the timing of both the decision-making episode and the interview. It gives participants the opportunity to reflect on the influences on their decision-making immediately after the event and overcomes this limitation to some degree, whilst allowing a more complete understanding of influences on decision-making and therefore a more comprehensive investigation.

2.7 Findings

2.7.1 Decision-making processes

The majority of studies found nurse practitioners used a process of hypothesis testing within their consultations (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Offredy, 2002; Ritter, 2003; Offredy, Kendall and Goodman, 2008; Pirret, Neville and La Grow, 2015; Pirret, 2016; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). Interpretation of this was dependent on the theoretical framework applied by the authors, and was considered either in the context of IPT and representative of the hypothetico-deductive model or Type 2 thinking associated with dual processing theory, or was applied to cognitive continuum theory (Hammond, 1996) and considered representative of analytical processing.

Within the studies hypothesis testing represented only part of the processes identified. The use of schema or chunking of information was identified in several of the studies (Burman *et al.*, 2002; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c) and is believed to represent how humans adapt to the limited capacity of the short-term memory within the framework of IPT (Ruland, 1996). Schema can be described as templates or cognitive scaffolds developed from clinicians' exposure to patients' clinical problems and represent an internal bank of disease prototypes which are accessed by recognition of patterns from a patient's signs and symptoms (Croskerry et al., 2017). Chunking is used to describe the clustering of signs and symptoms to represent patterns used to retrieve potential diagnoses. The use of schema and chunking bear similarities to the concept of the pattern recognition discussed in studies by Burman *et al.* (2002), Offredy (2002) and equally to System 1 thinking of dual processing theory used by participants in studies by Pirret (2016) and Pirret, Neville and La Grow (2015).

Offredy (1998) recognised that no single framework could encompass the cognitive processes of nurse practitioners and identified that participants used aspects of both IPT and Benner's (1984) intuitive humanistic model in her study. Ritter (2003) similarly found that neither IPT nor Benner's (1984) intuitive model could be exclusively applied to explain nurse practitioners' decision-making

and suggested a blended model to represent their decision-making. This was echoed by several studies that found participants used both analytical and intuitive processes in their decision-making (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Offredy, Kendall and Goodman, 2008). Rosciano *et al.* (2016) in her survey of 123 nurse practitioners found 100% reported the use of intuition in their consultations.

Abuzour, Lewis and Tully (2018c) was the only other study to create a model of decision-making to represent their findings. They identified a five-stage model of decision-making comprising; cue acquisition, hypothesis generation, case assessment, final hypothesis and decision-making. This bears similarities to the hypothetico-deductive model of Elstein, Shulman and Sprafka (1978), but differs in both its depiction of the influence of contextual factors and the individual's knowledge and experience, and in the additional stage of 'decision-making' which is defined as the decision to treat and prescribe. The authors described an oscillation between the stages, representing the complexity of prescribing decision-making. An important finding of this research was the difficulty participants experienced in mastering data to reach an autonomous final decision in the case assessment phase and consequently necessitated liaising with members of the multidisciplinary team (MDT) and patients. The final decision-making stage involved high levels of metacognition where the participants reflected on their knowledge and experience to determine whether they felt competent to treat the patient. This study, however, took place in secondary care and the findings may reflect the culture and team-based approach to patient care of this setting which may differ from that of nurse prescribers in general practice.

2.7.2 Studies comparing nurse and doctor decision-making

Five studies compared the decision-making processes of nurse practitioners to other practitioners (Offredy, 2002; Pirret, Neville and La Grow, 2015; Pirret, 2016; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). Abuzour, Lewis and Tully (2018c) found differences between nurse prescribers and pharmacist prescribers, in which nurses were more focused on the patient and taking a history and were more likely to undertake a physical examination of the patient, whilst pharmacists focused more on medication adherence. This demonstrates the value of investigating decision-making processes separately in order to identify areas for development in different professional groups.

The four other studies compared nurse practitioners' decision-making processes to those of doctors. Two studies (Pirret, Neville and La Grow, 2015; Thompson, Moorley and Barratt, 2017) found that similar diagnostic decisions were made by both nurse practitioners and doctors in the studies. Both used vignettes to investigate participants' decision-making. Thompson, Moorley and

Barratt (2017) allowed participants to choose a single vignette related to their specialty, whilst Pirret, Neville and La Grow (2015) used one complex vignette representing a typical presentation to tertiary care.

Offredy (2002), however, found that not all nurses compared to GPs had sufficient knowledge to generate appropriate hypotheses in response to six vignettes. This may be reflective of the diversity of presentations to general practice and the requirement of a broad knowledge base and is suggestive of differences in the experience and training of the two groups.

Offredy (2002) found the underpinning processes of nurse practitioners and GPs were largely similar although GPs were found to access less cues and were able to chunk larger pieces of information together which is representative of pattern recognition and Type 1, intuitive processes. This is similar to findings from Thompson, Moorley and Barratt (2017) who found secondary care nurse practitioners accessed more cues and their consultations generally took longer than doctors. Offredy (2002) attributed the efficiency of GPs in chunking information to their larger knowledge base which facilitated pattern recognition and it was hypothesised that GPs' ability to access less cues may be linked to differences in training. It was suggested that GPs' vocational training alongside experience in general practice may equip them better than the more generic expertise that nurse practitioners bring to general practice. Furthermore, it was suggested that the diagnostic training of NPs in Offredy's (2002) study resulted in NPs undertaking longer procedures of gathering information. Similarly, Thompson, Moorley and Barratt (2017) suggest that the difference in approach between doctors and NPs can be explained by medical training in which a pattern recognition approach to diagnosis is taught to doctors whilst nurse education focuses on knowledge-based decisions and problem-solving. Whilst this may take longer, it is protective from errors associated with other cognitive approaches.

This is in contrast to Pirret (2016) who found NPs to use more intuitive processes than doctors to inform their decision-making. This was cited as an expected outcome and was considered to reflect the nursing experience of NPs in the study who consequently drew more on intuitive processes whilst the analytical approach reflected the more formal training of the doctor participants. There are weaknesses in this study associated with a reliance on questionnaires and self-reported data to determine decision-making processes and its setting in New Zealand tertiary care limits its transferability. However, the finding that increased experience is associated with intuitive processes is consistent with Offredy (2002).

Pirret, Neville and La Grow (2015) used a single complex vignette to compare NP and GP diagnostic decision-making. They found that nurse practitioners who completed the scenario in the shortest time had the poorest diagnostic reasoning abilities. The authors considered this may

be indicative of the use of intuitive, Type 1, processing and thereby represented premature closure. They found that more experienced nurse practitioners were more accurate in their diagnostic reasoning and therefore less experienced nurse practitioners tackling a complex scenario were thought to be inappropriately using Type 1 thinking where the analytical processing of Type 2 was required, further supporting the importance of experience to safely apply intuitive processes.

2.7.3 Influences on decision-making processes

The findings from studies exploring the influences on decision-making were found to comprise a number of themes: knowledge, experience, guidelines, patient factors and support and culture of prescribing. These will be considered in the following section.

2.7.3.1 Knowledge

Many of the studies recognised knowledge and experience as key influences on decision-making (Offredy, 2002; Offredy, Kendall and Goodman, 2008; Pirret, Neville and La Grow, 2015; McIntosh *et al.*, 2016; Abuzour, Lewis and Tully, 2018a;c; Djerbib, 2018). Abuzour, Lewis and Tully (2018a) considered it the most obvious influencing factor with participants reporting the value of training courses and prescribing programmes in the interviews. Think aloud data also revealed how participants reflected on their knowledge and experiences to decide whether or not to make a prescribing decision. Those studies with a prescribing focus recognised the importance of pharmaceutical knowledge (Offredy, Kendall and Goodman, 2008; Djerbib, 2018), whilst Offredy, Kendall and Goodman (2008) highlighted the risk of inappropriate intuitive decision-making processes where pharmacological knowledge was not adequate.

2.7.3.2 Experience

Experience and exposure to clinical conditions was shown to facilitate decision-making and increase confidence (McIntosh *et al.*, 2016; Abuzour, Lewis and Tully, 2018c). Pirret, Neville and La Grow (2015) identified that increased experience was associated with improved diagnostic accuracy. In cases of uncertainty Offredy (2002) found nurse practitioners referring back to the GP, which was associated with lack of exposure to the particular condition.

Djerbib (2018) found experienced nurses tended to be more intuitive decision-makers. They were shown to deviate from guidelines which implied the use of more intuitive decision-making processes. Pirret (2016) found nurse practitioners to be more intuitive decision-makers than GPs, however this had associated risk when applied to complex scenarios and was associated with less experienced nurses.

2.7.3.3 Guidelines

McIntosh et al. (2016) found that evidence-based guidelines influenced nurse prescribers and represented the use of analytical processes, however it was also shown that experience was prioritised over guidelines where there was concern regarding complications or clinical uncertainty. This default to intuitive decision-making supports the findings of Djerbib (2018) and implies that in situations of risk nurse prescribers rely more on experience than evidence. Williams et al. (2017) identified that GP antibiotic prescribing was less influenced by protocols and guidelines and that they tended to base their decisions on a gut feeling. GPs within the study were viewed as more able to deal with complex patients than nurse prescribers and as these patients often fall outside of the guidelines this may explain GPs' use of intuitive decision-making in these circumstances. This indicates a recognition by nurse prescribers of the risk associated with this type of decision-making which is dependent on the knowledge and experience needed when prescribing antibiotics for complex patients.

2.7.3.4 Patient factors

Patient pressure and nurse practitioners' familiarity with the patient was also shown to influence decision-making (Burman *et al.*, 2002; Williams *et al.*, 2017; Djerbib, 2018). Nurse practitioners working in out of hours settings reported that patient anxiety or expectation may influence their decision-making (Williams *et al.*, 2017). This is supported by Djerbib (2018) who reported pressure from patients resulting in inappropriate or unnecessary prescriptions being issued which represents a rejection of analytical decision-making and adoption of intuitive-type processes.

2.7.3.5 Support and culture of prescribing

Supportive colleagues and team culture were found to be important in developing confidence in prescribing (Williams et al., 2017; Abuzour, Lewis and Tully, 2018a). Nurse prescribers were reluctant to prescribe outside of their role or scope of practice (Abuzour, Lewis and Tully, 2018a; Djerbib, 2018) and referred to doctors when they were unsure about a decision (Offredy, 2002; McIntosh *et al.*, 2016; Pirret, 2016; Abuzour, Lewis and Tully, 2018c). This is reflected in the findings of Abuzour, Lewis and Tully (2018c) where nurse prescribers were reluctant to make a final prescribing decision where they felt it was outside of their role and adopted an advisory role rather than act as prescribers. Djerbib (2018) found this perception of risk extended to prescribing for certain patient presentations, in particular for those with complex medical histories or who were taking multiple medications, and this was underpinned by anxiety regarding legal ramifications or lack of support from their employers . Nurse prescribers felt they lacked the necessary knowledge and skills and were more likely to refer to a GP in these instances.

2.7.4 Conclusion

Review of the studies show that nurse practitioners used a variety of processes to inform their decision-making and used both analytical and intuitive thinking. IPT and Benner's (1984) intuitive humanistic model underpinned the majority of studies with a recognition that aspects of both can be identified in nurse practitioners' decision-making. Abuzour, Lewis and Tully (2018c) presented a model to represent nurse prescriber decision-making processes. However, this was based on participants working in secondary care so potentially limits its transferability to other settings and furthermore is interpreted within the framework of IPT so therefore may not capture aspects of intuitive thinking recognised in other studies.

It was shown that both nurse practitioners and doctors used similar decision-making processes although doctors may have greater ability to chunk information and require less access to cues than nurse practitioners, making their consultations shorter and therefore more efficient (Offredy, 2002; Thompson, Moorley and Barratt, 2017). This may be linked to differences in training in decision-making between nurse practitioners and doctors (Thompson, Moorley and Barratt, 2017).

Multiple factors were shown to influence decision-making processes and impact on the quality of NPs' decision-making. Intuition informed by knowledge and experience was often relied on in the management of complex presentations (Offredy, 2002; Pirret, Neville and La Grow, 2015; McIntosh *et al.*, 2016; Williams *et al.*, 2017; Djerbib, 2018). Such presentations were considered to represent an area of risk for which nurse practitioners often felt they did not have sufficient knowledge or experience and consequently were frequently referred to a doctor (Offredy, 2002; McIntosh *et al.*, 2016; Pirret, 2016; Abuzour, Lewis and Tully, 2018c). There is some evidence that intuition used where there is insufficient experience can result in inappropriate decision-making (Offredy, Kendall and Goodman, 2008; Pirret, Neville and La Grow, 2015).

2.7.5 Implications for future research into nurse prescriber decision-making

This literature review supports the need for further investigation into the decision-making processes of nurse prescribers in primary care when managing complex presentations requiring diagnosis and prescribing decision-making. It has shown that there is limited research in this area and existing research has been undertaken with participants from different settings with a wide range of qualifications which restricts the transferability of results to the general practice setting.

Although evidence from one study (Pirret, Neville and La Grow, 2015) suggests that decision-making processes may be inappropriately employed by less experienced nurse practitioners, this

was based on the response to a single scenario by nurse practitioners in New Zealand and focused on the diagnostic process with little insight into the process of prescribing decision-making. Furthermore, there is some evidence to suggest that nurse practitioners struggle to make an autonomous prescribing decision (Pirret, Neville and La Grow, 2015; Abuzour, Lewis and Tully, 2018c) but these studies were set in secondary care and may not be reflective of primary care nurse prescribers.

This review has shown that nurse practitioners use combined processes to make decisions, and therefore in order to investigate these processes data collection should not be dictated by a single theoretical framework. A combination of methods using inductive analysis will allow interpretation through existing theories and avoid missing important aspects of decision-making that may otherwise miss being interpreted.

Vignettes in combination with think aloud have been shown to be effective as a data collection tool and overcome practical and ethical difficulties associated with observation. However, when applied to complex scenarios, staging the information given to participants and creating a requirement for them to request information rather than presenting the scenario as a whole should be incorporated within vignettes. The ability to request pertinent information to reach a decision is a vital skill in complex scenarios, and without investigating the collection of cues to inform decision-making only limited insights can be gained into decision-making processes.

2.8 Research question

After careful consideration of the literature, clinical experience and the background underpinning nurse prescriber decision-making in general practice, the following research question was developed:

What are the decision-making processes of nurse prescribers in general practice when managing episodes of acute illness in patients with multimorbidity and polypharmacy?

Aim:

This study investigates the decision-making processes of nurse prescribers in general practice when managing acute episode of illness in complex patients and explore how these nurses justify and explain their decision-making.

Objectives

To develop the use of think aloud method based on staged vignettes to investigate nurse prescriber decision-making for complex presentations in general practice.

To analyse audio-recorded think aloud data based on these vignettes in order to describe and characterise the decision-making processes of nurse prescribers in general practice applied to complex scenarios.

To identify how nurse prescribers in general practice justify and explain their decision-making in complex cases.

To make recommendations regarding how nurse prescribers may be supported in developing their role to manage complex cases.

Chapter 3 Methodology and methods

3.1 Introduction

This chapter will detail the methodology and methods that will be used to answer the research question. It will justify the methodological approach and consider the rationale and choice of data collection tools and methods of data analysis. Findings from a pilot study which informed the development of the vignettes and trialled the interview and think aloud processes will then be discussed. Finally, the process of undertaking the research will be detailed which will include a discussion of ethical issues and approval.

3.2 Methodology

This study is an exploration of the decision-making processes of nurse prescribers and a qualitative methodology was used. Qualitative methods can be used for research within the constructivist paradigm (Guba and Lincoln, 2005) which holds that individuals construct meanings in order to understand the world in which they live and this is dependent on their individual perspective and cultural background (Grbich, 1999; Guba and Lincoln, 2005; Creswell, 2009). Furthermore interpretation of these meanings are influenced by the experience and background of the researcher (Creswell, 2009). This is in contrast to the positivistic or quantitative paradigm which is underpinned by the belief that a single reality exists that can be observed and measured (Grbich, 1999; Guba and Lincoln, 2005).

Review of the literature has shown that the study of decision-making can be undertaken using different paradigms and methodological approaches and whilst the majority of studies used solely qualitative methods, three studies (Pirret, Neville and La Grow, 2015; Pirret, 2016; Rosciano *et al.*, 2016) used quantitative methods. This reflects the different aims of the research and whilst decision-making can be investigated quantitatively in order to establish the accuracy, appropriateness or patterns of prescribing practice (Little *et al.*, 2014; Cordoba *et al.*, 2015), these methods limit the ability for exploration and exposure of the rationale underpinning decision-making that is needed in order to gain an in-depth understanding of the complexities of decision-making inherent in prescribing for multimorbidity and polypharmacy (Smith, 2015).

As an experienced health care professional with knowledge of the research area, I was aware of the importance of acknowledging the influence and impact of this on the research process. Reflexivity, in which the researcher acknowledges the impact of their perspective on the study, and authenticity, which requires both the researcher and participants voices to be clearly conveyed, are important aspects of qualitative research (Tappen, 2011) and will be considered throughout the study and detailed in section 3.10

3.3 Data collection tools

This section will consider the rationale for the choice of data collection tools used within the study. Three methods were used: vignettes, think aloud and semi-structured interviews.

3.3.1 Vignettes

Vignettes combined with 'think aloud' were used to enable access to participants' decision-making processes. The literature review in chapter two has shown vignettes to be an effective and commonly used data collection tool to investigate decision-making. Their strength lies in their ability to effectively represent a clinical scenario and elicit responses comparable to real life situations, whilst overcoming many of the practical and ethical difficulties encountered when investigating decision-making in the clinical setting (Veloski *et al.*, 2005; Evans *et al.*, 2015). Whilst observational studies may more accurately represent reality, their value may be compromised by external factors which threaten internal validity (Veloski *et al.*, 2005). The ability to control external factors is a strength of vignettes; however, a limitation lies in their inability to convey sensual and contextual factors and therefore additional data collection methods may be required to explore these influences on decision-making. Importantly, observational studies do not allow the researcher access to the participant's cognitive processing and whilst the participant may attempt to report these retrospectively, such reports have been shown to be inaccurate accounts of the actual processes experienced during the task (Ericsson and Simon, 1984). This is recognised in studies by Marsden (1999) and Offredy (1998) whose attempts to use real life scenarios to explore decision-making resulted in participants needing to recall their decision making and as such may not accurately reflect cognitive processes. Vignettes are therefore a useful tool for research in decision-making where real life observation may be difficult or unethical and where the potential for vignettes to control some of the influencing factors on decision-making facilitates access to the cognitive processes of participants (Evans *et al.*, 2015).

A further limitation of the vignettes used in the literature, which was identified in the studies of nurse practitioner decision-making in chapter two, is the limited requirement for participants to

request the information needed to reach a decision. In most studies participants were given a complete scenario, or where there was the opportunity for participants to request information, the initial scenario contained significant content and consequently analysis of the information collected by participants was incomplete. Without a requirement for participants to request information needed to make a decision, decision-making processes cannot be accurately explored and there is a risk that the vital stage of data collection is overlooked. This stage is often complex in patients with multimorbidity and polypharmacy and therefore it is important that vignettes are constructed to capture this stage in decision-making.

In summary, vignettes to explore decision-making for patients with multimorbidity and polypharmacy need unique construction. They should be sufficiently complex to represent the range of factors needed to make a prescribing decision for this group of patients. Information within the vignette should be staged to allow for information to be requested by the participant with the facility to add verbal detail if needed. A pilot study was undertaken to inform the construction and process of vignettes which will be discussed later in the chapter.

3.3.2 Think aloud

For this research, think aloud in response to uniquely constructed vignettes was used to investigate the decision-making processes of nurse prescribers in complex presentations. The use of the think aloud method in conjunction with vignettes has been shown to be a useful tool to investigate clinical decision-making (Offredy, 2002; Ritter, 2003; Pirret, Neville and La Grow, 2015; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c). Think aloud as a data collection method is considered to closely reflect an individual's cognitive process (Ericsson and Simon, 1984) and allows valuable insight into the ongoing cognitive processes of the participant(Willis, 2005). Participants are asked to verbalise their thought processes whilst undergoing a task. The resulting concurrent verbal report is believed to yield complete and consistent data which may not be achieved by asking participants to recall events (Fonteyn, Kuipers and Grobe, 1993). Although this method has its roots in information processing theory, review of the literature shows it can be applied flexibly to identify processes from other theoretical frameworks (Ritter, 2003)

Think aloud in response to uniquely constructed vignettes was used to explore participants' decision-making processes in complex scenarios. It was recognised that certain contextual and subtle signs may not be adequately represented by vignettes, and these may be important in identifying intuitive decision-making represented by the intuitive-humanistic model. In recognition of this, additional data collection methods in the form of semi-structured interviews

were used to give participants the opportunity to explain their experiences of decision-making and to capture aspects of these processes that were not revealed using think aloud.

3.3.3 Semi-structured interviews

Semi-structured interviews can be used not only to explore a phenomenon but to clarify results from other data collection (Tod, 2015). This is supported by Fonteyn, Kuipers and Grobe (1993) who proposed that concurrent think aloud coupled with retrospective data from interviews can provide a near complete and detailed representation of an individual's problem-solving.

Inclusion of semi-structured interviews allowed not only a broader overview of nurse prescribers' prescribing practice beyond the vignettes, but also the opportunity to clarify and explore issues arising from think aloud data and influences on decision-making. An interview schedule was devised to guide the interview process and help maintain dependability of the research (Parahoo, 1997) (Appendix C). This was trialled and adapted in the pilot study phase (section 3.7).

3.4 Data analysis

Qualitative data analysis aims to interpret data through the identification of themes which may reveal new concepts or theory that arise from the data (Tappen, 2011). Two sets of data were generated from the research process; namely reports from the think aloud process and interview data.

When considering which method of data analysis to use for the think aloud data, protocol analysis for verbal reports as defined by Ericsson and Simon (1984) was considered. However, this method is complex and restrictive in its adherence to information processing theory; moreover it is unclear from review of the literature in Chapter 2 which theoretical framework is best applied to NIPs' decision-making in situations of complexity. Other studies of NIP decision-making processes have used a more flexible system of thematic analysis and coding which have been shown to be effective in its application to both think aloud and interview data (Ritter, 2003; Pirret, Neville and La Grow, 2015; Abuzour, Lewis and Tully, 2018c). Thematic analysis is a commonly used method of data analysis in qualitative research in which patterns are identified from the data and are analysed and reported to produce a rich description of the research data (Braun and Clarke, 2006). Braun and Clarke (2006) presented a six-stage guide to thematic analysis (Figure 2) in which codes are identified from the data and developed into themes.

Figure 2 Braun and Clarke's phases of thematic analysis

Phase	Examples of procedure for each step
1. Familiarising oneself with the data	Transcribing data; reading and re-reading; noting down initial codes
2. Generating initial codes	Coding interesting features of the data in a systematic fashion across the data-set, collating data relevant to each code
3. Searching for the themes	Collating codes into potential themes, gathering all data relevant to each potential theme
4. Involved reviewing the themes	Checking if the themes work in relation to the coded extracts and the entire data-set; generate a thematic 'map'
5. Defining and naming themes	Ongoing analysis to refine the specifics of each theme; generation of clear names for each theme
6. Producing the report	Final opportunity for analysis selecting appropriate extracts; discussion of the analysis; relate back to research question or literature; produce report

This approach to data analysis was chosen for this study as it can be applied flexibly and allows data-driven theory to evolve. Tappen (2011) described two approaches to coding; one which is data-driven, and codes are generated from the data without any preconceptions by the researcher and the second which is concept-driven and influenced by the researcher's exposure to theory and existing research. The literature review indicated that a single theoretical framework was not sufficient to explain NP decision-making processes and therefore it was important to use an inductive approach to data analysis driven by data rather than existing theory. Whilst the use of Braun and Clarke (2006)'s guide enabled an inductive approach to data analysis in this study it was recognised that existing theory could influence coding categories (Braun and Clarke, 2006). Furthermore, it would have been unrealistic not to acknowledge that my personal experience of the research area could influence the interpretation of the data. In order to minimise potential bias associated with this a reflexive diary was kept and secondary review of themes by the supervisory team was undertaken (section 3.10 (Lincoln and Guba, 1985)).

Computer programmes can be used to help manage the large volume of data generated in qualitative research and can assist in the process of coding and organising data (Creswell, 2009). In this study Nvivo software was used (QSR International, 2022) and proved useful in the

management of data although as a novice researcher not all functions offered by this programme were used.

Understanding of qualitative data can be enhanced by the inclusion of numerical data (Hammersley, 1992; Sandelowski, 2001; Maxwell, 2010; Tappen, 2011). This differs from the use of quantitative data in mixed method studies in which methods are specifically designed to collect and analyse both qualitative and quantitative data and sample sizes are calculated to enable meaningful statistical analysis of quantitative data (Turnbull and Lathlean, 2015). Consequently, caution is needed when numerical data are used within qualitative studies to avoid overcounting and generalisation of results that could be misleading. The use of such data should be focused on enhancing the meaning of qualitative data and verifying researcher interpretations (Maxwell, 2010; Sandelowski *et al.*, 2013)

In this study, in addition to thematic analysis, data such as qualifications and clinical experience were collected to characterise the participants. Outcome data were also collected from the think aloud process which included the diagnoses made by each participant and the outcome of prescribing decisions. Numerical data were collected in respect of several outcomes including the number of cues collected by each participant, the number of participants who completed each vignette independently and the number of participants who made appropriate diagnostic decisions and optimal prescribing decisions. The purpose of collecting this data was to enhance understanding and support interpretation of the study findings rather than to enable generalisation.

3.5 Maintaining rigour

Rigour in qualitative research refers to processes undertaken to minimise the influence of bias and maximise the reliability of findings (Mays and Pope, 1995). Mays and Pope (1995) further discussed that qualitative research is at risk of researcher bias and lack of reproducibility, but this can be minimised by ensuring that a clear account of methods is given, and assumptions made by the researcher are exposed.

Lincoln and Guba (1985) presented four criteria that need to be established in order to ensure the trustworthiness of qualitative research: credibility, transferability, dependability and confirmability. Credibility establishes how much confidence can be held in respect of the truth of the findings and requires measures to be taken to ensure that the findings accurately represent the reality of the area of research interest (Shenton, 2004). This can include undertaking measures such as triangulation of data and scrutiny from peers to challenge researcher assumptions (Lincoln and Guba, 1985; Shenton, 2004). Transferability refers to the applicability of

findings to other settings and relies on thick description or detailed accounts of the phenomenon under investigation (Guba and Lincoln, 2005). Dependability considers whether the findings are consistent and repeatable and can be demonstrated through detailed descriptions of the study methods (Forero *et al.*, 2018), whilst confirmability is maintained by exposing the measures taken to ensure the findings are shaped by participants and the influence of the researcher minimised. This requires a reflexive approach to be adopted by the researcher and is often achieved by the researcher keeping a reflexive diary in which decisions regarding methodologies and reflections on the research process are recorded (Lincoln and Guba, 1985).

These criteria are shown in Table 10 below in which they are applied to show how rigour was addressed in this study and cross referenced to sections where these are exemplified in the study.

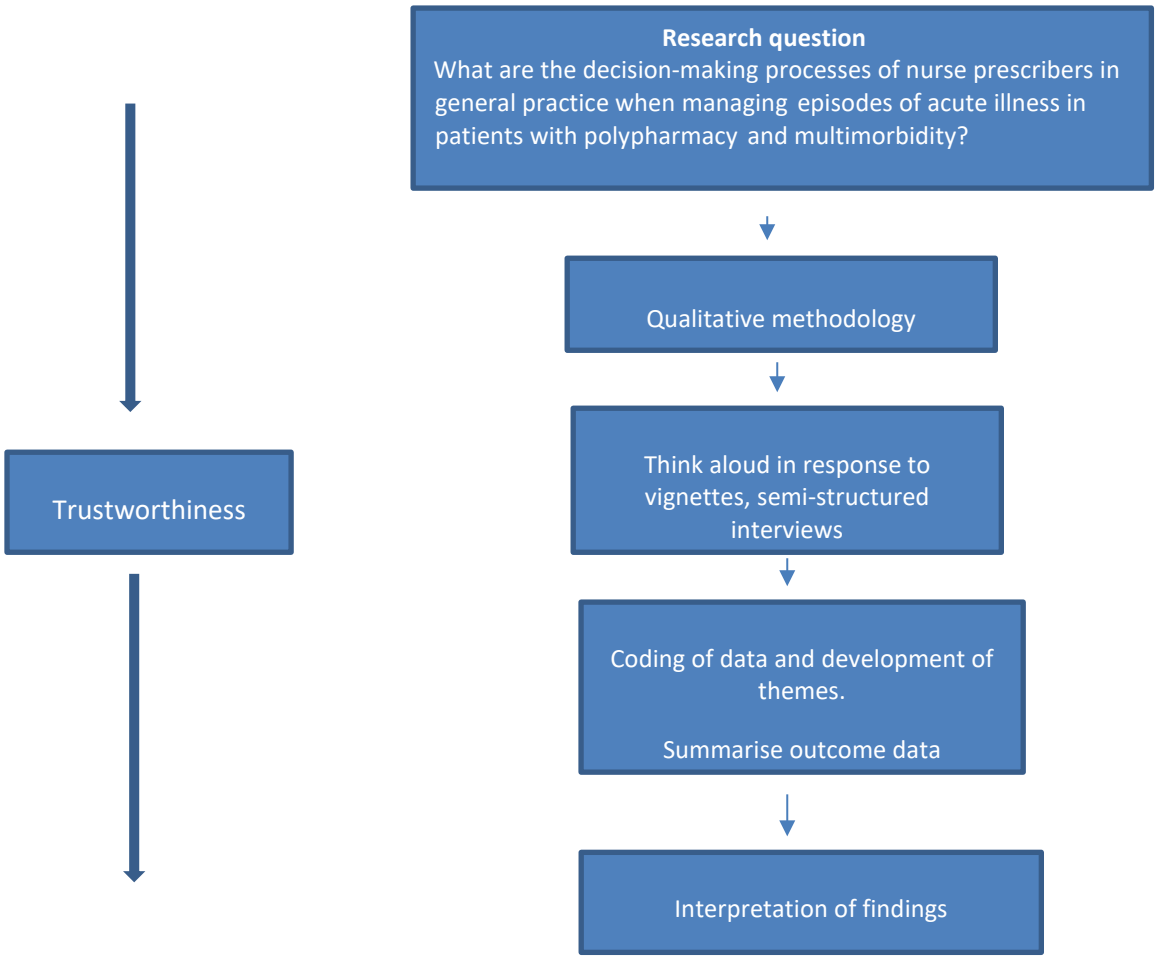
Table 10 Application of Lincoln and Guba's evaluative criteria

Criteria	Study application
Credibility	Clear description of methods. (Chapter 3) Pilot study to trial and develop vignettes (3.7) Triangulation of data: Use of vignettes, think aloud and semi-structured interviews (3.9.5) Peer debriefing: University ethics review (3.8.2) Meetings with supervisory team (3.10) Familiarity with research area from previous clinical experience (1.2) Maintenance of reflexive diary (3.10)
Transferability	Thick description: Clear recruitment criteria and profile of participants including qualifications, experience, and roles (3.8.1, 4.2) Use of direct quotes to represent findings (Chapter 4)
Dependability	Clear description of methods (Chapter 3) Clearly established process of think aloud (3.8.3.1) Semi-structured interview schedule (Appendix C) Clear process of data analysis (2.5.1.7) Review of themes with supervisory team (3.10)
Confirmability	Clear description and rationale for methods (Chapter 3) Maintenance of reflexive diary (3.10) Review of themes with supervisory team (3.10)

3.6 Summary of methods

A flowchart summarising the methods is presented in Figure 3

Figure 3 Summary of methods



3.7 Pilot study: development of data collection tools

3.7.1 Vignettes

This section will discuss the development of the vignettes which was undertaken using a pilot study. Four vignettes, including one trial vignette were written, drawing on personal clinical experience and in discussion with the supervisory team. These were designed to represent typical acute presentations of patients with multimorbidity and polypharmacy in general practice with information staged to represent as much as possible an actual clinical consultation. The vignettes were reviewed for face and content validity (Jones and Rattray, 2015; LaFond *et al.*, 2015) and

clinical accuracy by an expert panel comprising a GP senior partner and experienced nurse prescriber who is also a programme lead for the non-medical prescribing programme. The vignettes were then trialled by two advanced nurse practitioners in the pilot phase of the study to test both the content of the vignettes and the process of staging the delivery of the vignettes in the context of think aloud.

3.7.1.1 Composition of vignettes

The choice of the presenting complaint for each vignette was based on personal experience of working as an ANP in general practice in several surgeries with different patient demographics. Conditions were chosen that were frequently encountered across the different surgeries and which I considered presented prescribing challenges. The content of each vignette was informed by referring to patient presentations in practice and clinical guidelines as referenced in the vignettes themselves. This ensured that the content was evidence-based and as realistic as possible. Key diagnostic and prescribing issues were identified for each vignette which would later help make some judgement about the nature of diagnostic and prescribing information collected by participants (Appendix D). The vignettes were designed to include different aspects of complexity associated with multimorbidity and polypharmacy. Prescribing decision-making within the vignettes presented different challenges for participants - for example, the management of complex drug interactions and allergies and drugs with a narrow therapeutic index. The first vignette was designed to represent a more straightforward prescribing decision-making which was then followed by more complex prescribing decision-making in the three other vignettes.

The use of personal experience risks introducing bias in the selection of cases and may be reflective of my own clinical experience, however, this was mitigated to some extent by the varied nature of this experience, and importantly by seeking review of the vignettes by other clinicians to ensure content and face validity (section 3.7.1). Content validity confirms the extent to which a test represents the phenomenon under investigation (Parahoo 1997), which in this case refers to how appropriately each vignette represents actual clinical presentations of acute illness in patients with multimorbidity and polypharmacy presenting to general practice. Face validity assesses the relevance and clarity of the vignettes (Jones and Rattray, 2015)

3.7.1.2 Staging the vignettes

The format of each vignette was based on a clinical consultation. It was decided to divide the consultation into stages to represent the acquisition of information within a consultation. Each stage of the consultation was represented on separate cards (Appendix D). An initial card was used to give information that would usually be available on the home page of the patient's notes. The predicted content of the consultation was then divided into sections as represented in the vignettes (Appendix D). The reason for staging vignettes in this way was to avoid giving information that may not otherwise have been sought, and thereby allowing a more nuanced assessment of decision-making. It was difficult to ascertain how much information to put on each card and it became apparent whilst writing these that I would have to accept that I may under or over represent the required detail in each card, and thus feedback from a pilot study would be valuable. If additional information that had not been anticipated was requested, it could be given verbally by the researcher during the interviews and would need to be noted and kept for reference in case this should be asked by another participant. This is an important aspect of maintaining dependability.

3.7.1.3 Review of vignettes

The vignettes were reviewed by two prescribers to ensure face and content validity and to check for clinical accuracy. The reviewers were an experienced GP and a nurse prescriber who is also a programme lead for non-medical prescribing. Some adjustments were made following this process which included the addition of a picture of the rash presentation to vignette 1 and a clinic letter to vignette 3. A table detailing these adjustments can be found in Appendix E.

3.7.2 Trial of think aloud and semi-structured interviews

Two experienced ANPs agreed to pilot the think aloud process and semi-structured interviews. The process of think aloud was not audio-recorded. This decision was made as the purpose of the pilot was to trial the process of think aloud and to refine the content of the vignettes rather than to inform data analysis. Moreover the discussion that occurred during the trial process of think aloud was disruptive to the process and consequently would not accurately represent the cognitive processes of the participants (Ericsson and Simon, 1984).

3.7.3 Recruitment - pilot study

Two clinical colleagues with similar characteristics to participants who would otherwise be excluded from the main study due to close working relationships with the researcher were recruited to undertake the pilot study interviews. They were approached via their line manager and agreed to participate in the pilot study. They were given an information sheet and consent form (Appendix G, Appendix H) and informed the researcher they were willing to participate. This indirect approach from the researcher helped ensure they did not feel coerced into participating. Participants were given a £25 gift token in recognition of the time they were committing to the study (section 3.8.1.1)

3.7.4 Data collection – pilot study

A time and place convenient to the participants was arranged and the consent form was signed. The process of think aloud and interviews were trialled but the think aloud process was not recorded as the purpose was to rehearse the process and develop the vignettes. The pilot study included an additional informal conversation in which participants discussed their experience and views on the vignettes and process and made suggestions for changes. The semi-structured interview was audio-recorded on an encrypted audio device to enable accurate recall of the discussion. Notes were made from this recording after the interviews were complete and the recording deleted from the audio device.

3.7.4.1 Assessment of vignettes and think aloud

Both pilot participants were comfortable with the think aloud process and needed very little prompting, some minor amendments were made to the initial instructions which included emphasizing the need to clearly articulate a final prescribing decision.

The vignettes were considered appropriate and representative of typical complex presentations. Further amendments to the vignettes were suggested by the pilot participants which included reducing the information on the first card to patient demographics and the presenting complaint only, as it was agreed that not all participants would review the patient's notes before seeing them and would therefore not access that level of information, and to include a card representing the initial impression or 'general survey' of the patient. An important amendment was to add a card to alert participants to allergies and drug interactions. One trial participant did not identify an allergy or a drug interaction during the think aloud process and on discussion this was felt to be a limitation of the vignettes as in practice an alert would be generated by the computer system

at the point of prescribing in such situations. A summary of amendments can be found in Appendix F.

3.7.4.2 Trial of semi-structured interview schedule

The questions in the interview schedule were found to be appropriate. The inclusion of an additional question was agreed that would help establish how participants perceived their approach to the consultation process.

3.7.5 Summary

The pilot process provided a valuable opportunity to modify the vignettes and rehearse and adapt the process of think aloud and semi-structured interviews to represent as accurately as possible real clinical scenarios and to maximise the exposure of participants' decision-making processes. Seeking review of the vignettes first by two experienced prescribers and then trialling the process with two ANP participants proved comprehensive in identifying areas that required adapting or developing within the vignettes, semi-structured interviews and process of think aloud. It also allowed for consideration of how to manage any new issues that arose in the think aloud stage that had not been anticipated.

Although this pilot study was not focused on informing data analysis, it was noted that some aspects within the past medical history and patient presentation were not considered by the participants, and furthermore these differed between the participants. Offredy (2002), in her comparison of GP and nurse practitioner decision-making, used a reference model for each vignette detailing critical and relevant information. It was decided to identify key issues within the vignettes that could inform prescribing-decision-making which were verified by the vignette reviewers and can be found at the end of each vignette (Appendix D) Establishing these criteria for the vignettes would later help in the data analysis stage of the study. Final versions of the interview schedule and vignettes can be found in Appendix C and Appendix D respectively.

3.8 Research design

3.8.1 Recruitment of participants

This section will describe the sampling and recruitment of the study participants. This will be followed by a discussion of research governance and then the process of data collection and analysis will be detailed. Reflexivity will then be considered in the final section.

3.8.1.1 Main study

A purposive sample of 20-30 nurse prescribers who regularly managed acute illness presentations in adults with polypharmacy and multi-morbidities in general practice was initially sought. Inclusion and exclusion criteria were determined and are represented in Table 11 below.

Table 11 Inclusion and exclusion criteria of study participants

Inclusion criteria:

Working as a nurse prescriber in general practice in a role which involves regularly prescribing for acute illness presentations in adults with polypharmacy and multi-morbidity.

Exclusion criteria:

- Immediate colleagues of the researcher will be excluded from the study as familiarity of their clinical practice may compromise data analysis.
- Nurse prescribers working for organisations other than general practice such as community nurse independent prescribers, as this study will be limited to nurse prescribers managing acute clinic presentations in general practice and therefore will not include attached staff such as community nurse independent prescribers.
- Nurse prescribers whose role is predominantly chronic disease management and who do not manage acute non-differentiated presentations as part of their role.

Purposive sampling was used in order to target participants who were most likely to provide rich data relevant to the research question and this strategy is commonly adopted in qualitative research (Grbich, 1999). Tappen (2011) recognised that although this introduces a purposeful bias into the sample this can be differentiated from problematic unintended bias that may result from

reliance on one or two participants or on unusual events or representations, the consequence of which may mean that normal but important activity is overlooked.

Participants were recruited from GP practices from several clinical commissioning groups (CCGs) in the Wessex region. Initially four CCGs were targeted. A brief scoping exercise showed these four CCGs had the highest proportion of nurse prescribers in the Wessex region. These CCGs were also chosen for initial targeting for practical reasons of accessibility in terms of their geographical proximity but importantly two of the CCGs were known to have higher than average deprivation and lower than average life expectancy (Public Health England 2017), which means they were likely to represent a population with increased prevalence of chronic diseases requiring medications and consequently nurse prescribers working in these areas were likely to be a source of rich data.

Potential participants were contacted via email through the practice manager of individual practices. Contents of the email included a letter, information sheet for participants, a consent form (Appendix I, Appendix J, 0) and an email address for them to make contact should they agree to participate. In addition, CCG prescribing leads were asked to distribute details of the study as listed above to nurse prescribers in their CCG. This was to maximise the likelihood of nurse prescribers receiving the information.

Royal College of Nursing guidance advises that research participants should not be coerced into participating in research nor 'unduly persuaded by the offer of a reward' (Royal College of Nursing 2009). Using a third party to contact potential participants serves to protect against coercion. Participants were also offered a £25 gift token in recognition of the time they committed to the study and to act as an incentive to participate. This funding was made available from university sources. Ethical guidance from the Health Research Authority (HRA) consider undue coercion to exist where excessively attractive rewards are offered for participation in an activity where they may otherwise have had real objection, either through risk or beliefs (Health Research Authority 2014). This was a small sum and a gesture to show appreciation of their participation and as such acted solely to show appreciation of individuals' participation rather than any suggestion of coercion.

GP practice managers and CCG prescribing leads were contacted in a staged approach and this process took place over the course of a year. An estimate, calculated from accessing individual practice websites, showed that potentially over 80 nurse practitioners could be employed within the four local CCGs to be initially targeted, so it was important to test the level of response by staging my approach and avoid being overwhelmed and finding I did not have the capacity to undertake the interviews. Visits to the practices to give more information about the study were

offered but not taken up. In addition, CCG prescribing leads were approached for opportunities to speak at educational forums for nurse prescribers. This resulted in my attending two events and a few participants expressed an interest through this route. There was no one method of recruitment that proved more successful than others. Participants reported receiving information about the study from several sources which, in addition to those listed above, included word of mouth from colleagues who had seen the study information and encouraged them to take part.

Although there was a good initial response, after contacting all GP practices in the Wessex region and CCG prescribing leads, only 14 participants were recruited to the study. However, through the interview process and initial analysis of data it became apparent that data saturation had been achieved so recruitment was not pursued beyond this. This was supported by Flick (1998) who considered sampling can stop once it is established that further data collection provides no new knowledge.

Once a potential participant showed an interest they were contacted by email and phone to arrange a date and time convenient to them and any initial questions they had were addressed. Establishing an initial rapport in this way was beneficial to the research process (Grbich, 1999). Participants were reminded at this stage that participation in the study was likely to take up to two hours of their time which was also specified in the participant information sheet.

It was noticeable that half of the participants were known to me either through clinical or teaching contacts and the majority of participants were recruited from the CCG in which I worked, both as a clinician and academic. However, none were colleagues with whom I worked closely or students who I was currently teaching and although this familiarity potentially facilitated the initial rapport with these participants, as experienced health care professionals it was considered unlikely to influence the process. A reflexive diary was kept during the interview process to heighten my awareness and protect against any difference in approach to individual participants. The use of such diaries allow important reflection on the research process (Flick, 1998).

3.8.2 Research governance and ethical approval

Research ethics should consider both the rights of the people who participate in research and the responsibilities of those who conduct it (Tappen 2011). Ethical approval was granted from the University of Southampton School of Health Sciences Ethics Committee to undertake the study following internal faculty peer review (Ref 45755). Insurance and sponsorship was gained from The University of Southampton (Appendix M).

Research governance approval from participating CCGs was obtained via the HRA (0). and the Integrated Research Application System (IRAS) (reference 251810). Research and development authorisation was granted from the Wessex Clinical Research Network (CRN) (Appendix N)

3.8.2.1 Consent

Participants were approached via a third party to ensure they did not feel pressured into participating in the research. Although there was a small financial incentive offered for participation this was not considered coercive (see 3.8.1). Participants were given an information sheet detailing the nature of the research and a consent form to sign and an opportunity to discuss any further questions regarding the research and consent during the initial phone contact.

3.8.2.2 Confidentiality and data storage

Anonymity has been upheld by ensuring that participants are not named, and no mention is made of an individual's places of work in the stored data or write up of the thesis or any publications. In addition, participants have been anonymised by allocation of a number.

Although reference has been made to the study taking place in the South of England, with some demographic information available regarding role and professional qualifications, it is extremely unlikely that individual participants could be identified in any publications. Any direct quotes used in the write up of the thesis and any publications have been anonymised by the researcher and participants referred to by allocation of a number, e.g. Participant 1.

As this study concerns issues of professional practice it was important to outline the limits of confidentiality to participants. As a registered nurse I am duty bound by the NMC to report any malpractice should it be disclosed, and participants were informed of this. This did not appear to impact on the participants who were experienced professionals and as such fully understood this requirement.

Participant contact details were kept on a printed document and each participant allocated a number. This information was kept in a locked filing cabinet and shredded after completion of the interviews. Consent forms were scanned and stored securely on the University of Southampton server within 24 hours. Paper copies were then shredded.

Data from the interviews was audio recorded on an encrypted audio recorder which was downloaded within 24 hours of the interview and stored securely on the University of Southampton password protected server. The audio recording was then deleted from the recording device. This was then transcribed and any identifiers, for example place of work, were anonymised. A professional transcribing service was used to transcribe some interviews in order

to manage the workload. In these cases audio recordings were sent via encrypted email. Participants were made identifiable only by a number. The audio recording was then deleted from the server.

After the research study has been completed data will be stored securely for at least 10 years on ePrints Soton, which is a long term data repository available through the University of Southampton.

3.8.2.3 Beneficence and non-maleficence

Researchers are required to minimise risk and maximise benefits to participants (Tappen 2011). This study posed very little risk to participants. The time commitment may have increased their workload, but participants were fully aware of the commitments of the research prior to enrolment and could have withdrawn at any point. It is likely that participants may have benefitted from increased awareness of their decision-making processes and identified learning points from participation in the research which may have subsequently improved their clinical practice. However, there was a possibility of some participants revealing a lack of knowledge or support in prescribing in this area of practice. Nevertheless, this did not occur during the research process, but I had determined prior to the research interviews the best approach for dealing with this situation should it have arisen.

3.8.3 Data collection

Data collection was undertaken at a time and place convenient to participants where internet access was available, which was to ensure that participants were able to access any resources they usually used to support their decision-making. In addition a copy of the British National Formulary (National Institute of Health and Care Excellence, 2021a) was made available. The place of interview varied between participants, and some chose to be interviewed in their own homes, others in the university and some in their place of work. Allowing participants choice over the place of interview was considered important to encourage participation and ensure they felt comfortable to undertake the interview but it was recognised this may result in accepting some distractions during the interview process (Topping, 2015). Generally, any disruption to the process was minimised but it was noticeable that those interviewed in their own homes experienced more interruptions to the interview process which were negotiated at the time.

Data collection continued until no new themes emerged from think aloud data or semi-structured interviews and data saturation was achieved. This approach is commonly considered appropriate to determine sample size in qualitative research (Flick, 1998).

3.8.3.1 Data collection - think aloud

Initially it was anticipated that the first vignette would act as a trial for the think aloud process and the data would not be recorded or used for data analysis. The intention was for this vignette to represent a less complex diagnostic and prescribing scenario which would enable participants to focus on the process of think aloud rather than the complexity of the clinical case. This would then allow for guidance to be given by the researcher which generally should be avoided during the actual data collection as this can disrupt the think aloud process (Ericsson and Simon, 1984). However, after the first participant's interview it became apparent that valuable insights into decision-making processes could be gained by using the data from this vignette and furthermore that participants undertook the think aloud process with ease. It was therefore decided after consultation with the supervisory team that data from the first vignette would be recorded and included in the findings, although this would exclude responses from Participant 1 for this vignette as this was not recorded.

The think aloud process started with participants being given a card with information containing a brief description of the patient's presenting complaint and summary of past medical history and repeat medications to replicate information that is readily available on the computer system (Appendix D). They were then asked to think aloud their thoughts and to request further information as needed. This information was presented as requested on pre-prepared cards which were differentiated by topic, e.g. recent blood test results, vital signs, clinical examination of individual systems (Appendix D). It was ensured that access to the drug formulary (National Institute of Health and Care Excellence, 2021a) and the usual on-line resources e.g. antibiotic guidelines that participants used to support their consultations were available. Participants were encouraged to think aloud throughout the process. Verbal prompts were given such as 'carry on thinking aloud' if participants paused for more than a few seconds (Ericsson and Simon, 1984).

All participants were able to undertake think aloud, and for some this was more natural than others. One participant required lots of prompting to think aloud as she had a tendency to go quiet and internalise her thinking. A general observation was that at times most participants wanted to discuss the cases and have a clinical conversation and I had to resist the temptation to engage with this and direct them back to thinking aloud. Participants requested information

throughout the think aloud process and collected the cards which they used to refer back to and support their decision-making. There was considerable variation between individual participants as to the amount of information collected for each vignette.

3.8.3.2 Data collection - semi-structured interviews

Interviews took place immediately after the think aloud stage. An interview schedule was used (Appendix C) which allowed exploration of the decision-making processes verbalised in the data collection process and gave an opportunity to further discuss participants' views on prescribing for adults with multi-morbidity and polypharmacy. The interview was also used to collect information regarding participants' qualifications and clinical experience. Open ended questions were used which allowed participants to talk freely. It was anticipated that this stage would take approximately 30-60 minutes, which proved a realistic estimation with participants enjoying the opportunity to explore their clinical practice. As a fellow clinician, participants often asked my view or wanted to engage in a clinical discussion, and it was tempting to engage with this. However, it was important to remain neutral and a reflective journal was kept throughout the interview and think aloud processes to maintain reflexivity and to recognise the influence of my role on the research process (Gribch, 1999; Dodgson, 2019)

3.9 Data analysis

This section will describe the process of analysis of think aloud and interview data that informed the findings in chapter four. Qualitative data analysis can be challenging for researchers who are often faced with vast amounts of data from which they are expected to produce a cohesive report that is representative of both diverse and complex views and which should be undertaken in a robust, transparent way that is reflective of participants accounts (Noble and Smith, 2014). To aid this process, data analysis was informed by Braun and Clarke's (2006) framework of thematic analysis (section 3.4) which could be used flexibly across both think aloud and interview data to generate meaning from the data.

3.9.1 Transcribing the data

The first stage of this process was to transcribe the interviews verbatim. The process of transcribing allows immersion in the data whilst knowledge of the research area can enhance the accuracy of the transcription process (Fonteyn et al. 1993). Due to time factors and the length of

the interviews, a professional transcription service was used to transcribe some of the interviews. Although there was a risk that this could distance me from the data, the transcripts were checked and read several times to maximise familiarisation with their contents. Transcripts were uploaded into NVivo which facilitated access and helped the process of coding.

3.9.2 Participant characteristics

Data that provides rich and thick description forms a key component of qualitative research (Tappen, 2011). An important part of the initial stages of data analysis was to identify from the transcripts characteristics of the participants in respect of their age, experience and qualifications. In addition, key aspects of their roles and the structure of their clinics were described.

3.9.3 Coding and development of themes

The initial process of coding involved reading through the think aloud transcripts and interview data multiple times to inform the development of initial codes. An inductive approach was taken to this process. Braun and Clarke (2006) recognise that when taking an inductive approach to data analysis, it is not possible for researchers to shed the influence of existing theory; however inductive analysis, unlike theoretical thematic analysis, is not driven by a particular theoretical approach. During the process of analysis, I was aware of the potential influences from my knowledge of decision-making literature and associated theories and tried to ensure that as much as possible codes were generated from the data and driven by the language used by participants. Memos were made during analysis of the data, alongside discussions with the supervisory team and the maintenance of a reflexive diary to assist with this process.

Transcripts of think aloud and interview data were read several times and codes applied across the entire data set. NVivo software was used at its simplest level to create codes and subheadings. Line by line coding was undertaken for the think aloud and interview data for each participant. The transcripts were frequently revisited during the process to ensure that no data were missed and that no deviation was made from the actual content of the transcripts (Braun and Clarke, 2006)

A large number of codes were generated from both the think aloud and interview data in the initial stages. Braun and Clarke (2006) advised against restricting the number of initial codes and to look for as many patterns or themes as possible. Data from think aloud and the interviews

were initially coded separately. Analysis of think aloud data allowed codes to be generated in different ways. For example, in the extract below the clustering of cues resulted in an instant hypothesis (heart failure) which could be coded as 'recognising patterns' which is then reinforced by reviewing the language used by the participant where the use of 'right away' implies an instant decision typical of pattern recognition.

> *'Foot swelling, hypertension, COPD, right away I'd be thinking heart failure' (Participant 3, vignette 2)*

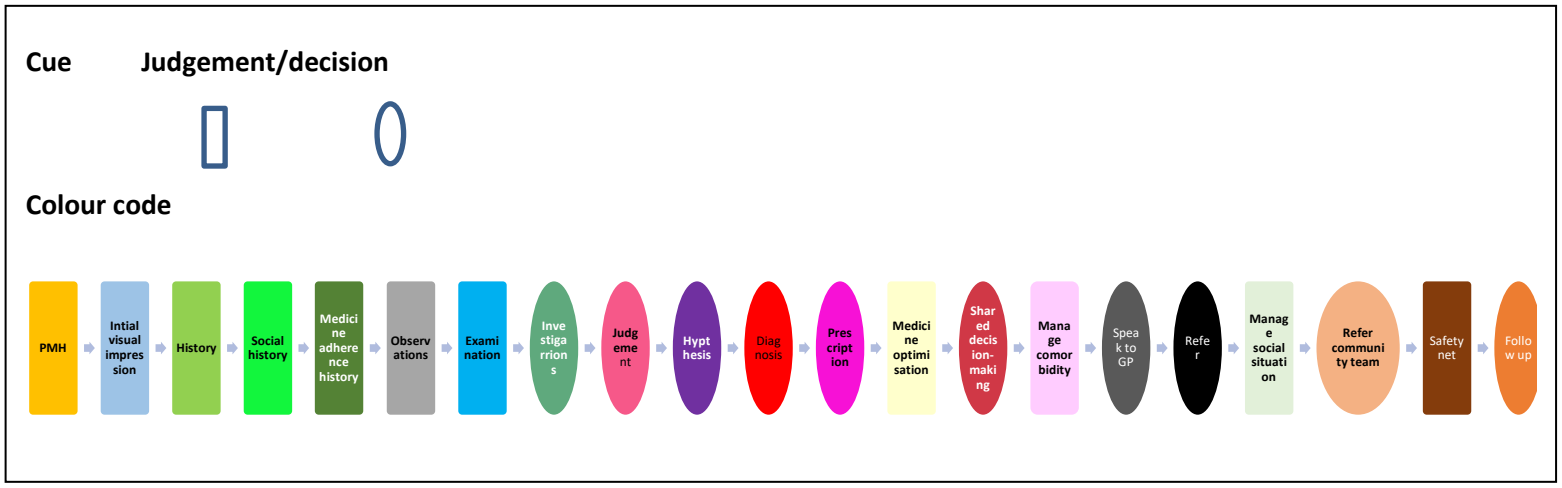
Codes from analysis of think aloud were then considered alongside codes generated from the semi-structured interviews in which participants explained their decision-making and this was used to confirm or develop existing codes. For example, in the interview extract below, Participant 9 describes her diagnostic processes in response to vignette 1 as a process of instant recognition of a clinical scenario that she recognised from previous experience. This was interpreted and coded as 'recognising patterns' and supported codes generated from think aloud data.

> *I think it's because it's a scenario that you see quite often so you feel very, very confident in going ahead and diagnosing and making those decisions on that and probably almost over confident in it because you see it so frequently that you go 'yup that's it' and I suppose I didn't take as long to think could it be anything else and I think it's quite clear cut sometimes (Participant 9, interview)*

Codes were then considered and combined to form sub-themes and four over-arching themes were established: structure of the consultation, diagnostic decision-making processes, prescribing decision-making processes and explaining decision-making.

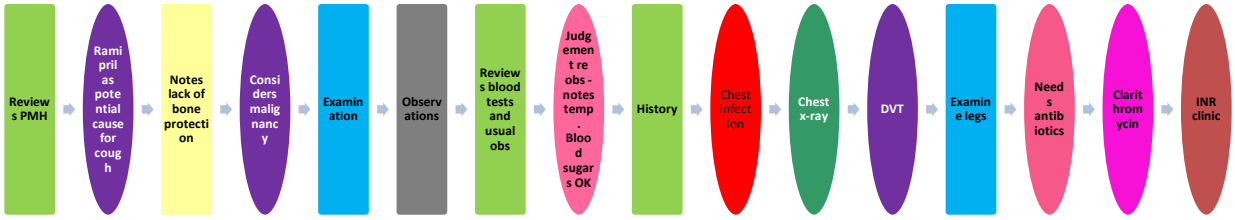
It became clear that to better understand the theme of 'structure', pictorial presentation of the codes generated from think aloud data would enhance understanding and enable comparison between participants. Figure 4 below represents the range of cues, judgements and decisions used by participants during the consultation. Cues were colour coded to represent the different content collected such as social history, observations and examination findings and were represented by rectangles. Judgements and decisions were represented by an oval shape and included hypothesis generation and decisions such as diagnosis, prescription and referral. This enabled comparison of the structure and content of consultations between participants, including the range of cues collected and the number of judgements and decisions made during the consultations.

Figure 4: Codes for structure of consultations



The codes shown in Figure 4 above were applied to think aloud data for each participant to portray the structure and content of their consultations in response to each vignette. An example is given below in Figure 5 and shows the coding for the consultation of Participant 3 in response to Vignette 4

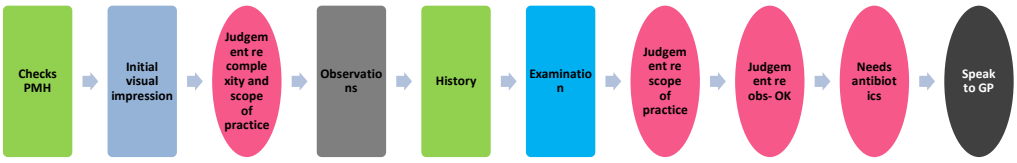
Figure 5 Participant 3 coding of consultation (Vignette 4)



This representation enabled comparison with other participants and revealed different approaches to the consultations. This is exemplified by comparing the structure of Participant 3's consultation (Figure 5) to that of Participant 5 (Figure 6) in which fewer cues were collected and a decision was not made regarding the final diagnosis or prescription and the outcome was a referral to the GP

Figure 6 Participant 5 coding of consultation (Vignette 4)

Participant 5



Appendix O gives an example of the coding of consultations for all participants in response to vignette 3.

A similar process was used to examine more closely the prescribing decision-making of each participant. An example of this in relation to vignette 1 can be found in 0. Representing coding in this way allowed not only information about the structure of prescribing decisions and the nature of cues collected to inform participants' decision-making to be visualised but also for some inferences to be made regarding the decision-making processes used by participants. This is exemplified in

Figure 8 below which shows participant 3's prescribing decision making in response to vignette 1 (colour codes are shown in Figure 7).In this example participant 3 responds to the diagnosis of shingles by appearing to instantly recall the drug to prescribe which is entered into the computer without further consideration. Recall was classed as an intuitive process. This is in contrast to the example in Figure 9 in which a more prolonged and analytical process is conveyed.

Figure 7 Colour codes for structures of prescribing decision-making

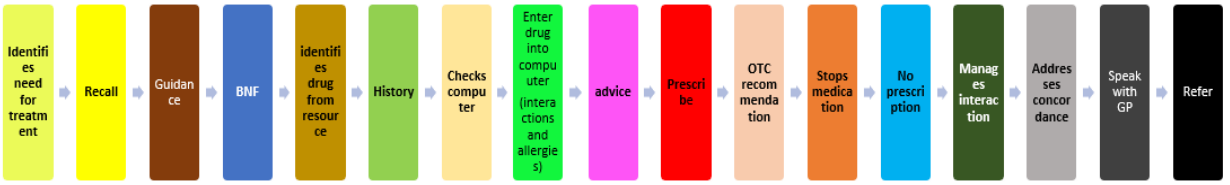
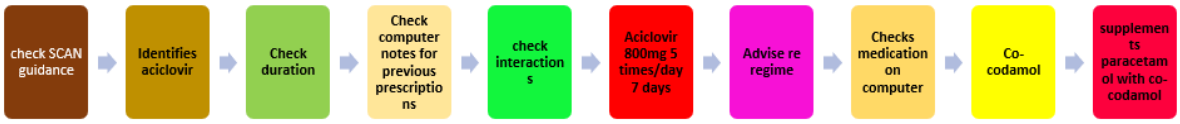


Figure 8 Participant 3 coding of prescribing decision-making – vignette 1

Figure 9 Participant 4 coding of prescribing decision-making – vignette 1



Furthermore, this method of coding participants' prescribing decision-making showed the relative competence of individual participants in prescribing decision-making across the four vignettes. This is exemplified in Figure 10 and Figure 11 below which compares Participant 13's prescribing decision-making in response to vignettes 2 and 4. This shows her to refer to GP when the prescribing becomes complex after identifying issues with the patient's renal function in vignette 2, whilst she independently negotiates the complexity of drug interactions associated with vignette 4.

Figure 10 Participant 13 coding of prescribing decision-making – vignette 2

Figure 11 Participant 13 coding of prescribing decision-making vignette 4

The use of pictorial coding of the data enabled judgements to be made regarding the structure and content of consultations of vignettes, which allowed comparisons to be made between and within participants across the vignettes. Inferences could be made regarding the type of decision-making processes used by participants and the relative level of competence of individuals' when undertaking the vignettes. This method of coding and analysis helped manage the large amount of think aloud data and supported the development and interpretation of codes from the think aloud and semi-structured interviews.

Decision-making processes were identified from the data in different ways. Intuitive processes such as pattern recognition, intuition and recall were identified from the language used by participants when thinking aloud. For example, the use of terms such as 'straight away' or 'immediately' were likely to signal an intuitive response. Intuition could be identified from the language used by participants for example where participants referred to 'gut instinct' or relied on an instinctive impression, whilst the way in which participants managed the data they were gathering from the vignettes eg the clustering of cues to reach a decision, enabled identification of intuitive processes such as pattern recognition. This coding was supported by interview data in which participants explained their decision-making. Furthermore, pictorial representation of participants' responses to the vignettes allowed a visual impression of the duration of decision-making which enabled a distinction to be made between intuitive and analytical processes. A prolonged process of data collection prior to reaching a decision or referring to additional resources was indicative of analytical processes and could be easily identified from the think aloud transcripts and pictorial data.

In summary, themes were developed from coding generated from think aloud data and semi-structured interviews and pictorial representation of participants' consultations. Data saturation was achieved during this process.

3.9.4 Quantification of data

In addition to coding the data as described above, it was decided that in order to aid interpretation of the findings some quantification of the data would be beneficial (Tappen, 2011).

It was recognised that the data was to aid understanding of themes rather than to make generalisations about participants (Maxwell, 2010).

Initially each participants' response to each vignette was analysed to see to what extent they addressed the key issues identified for each vignette (Appendix D). An example of this in respect of Vignette 3 can be found in Appendix Q. A further summary table was made to show the range of additional complex factors attended to by each participant across the vignettes (4.3.2.1). Data were then analysed to compare the outcomes of participants' decision-making including the range of diagnoses and differential diagnoses made by each participant in response to each vignette and how these compared to the anticipated diagnoses for the vignettes (4.4.1). The outcomes of prescribing decisions were collated and similarly compared to the optimal decisions for each vignette (4.4.2). In addition, the number of participants who completed the vignettes independently and the reasons for referral were also collated (4.4.3). Summarising the data in this way and viewed alongside the pictorial representation of codes described in section 3.9.3 enabled me to view not only how participants responded to individual vignettes but also to track and assess the responses of each individual participant across the vignettes.

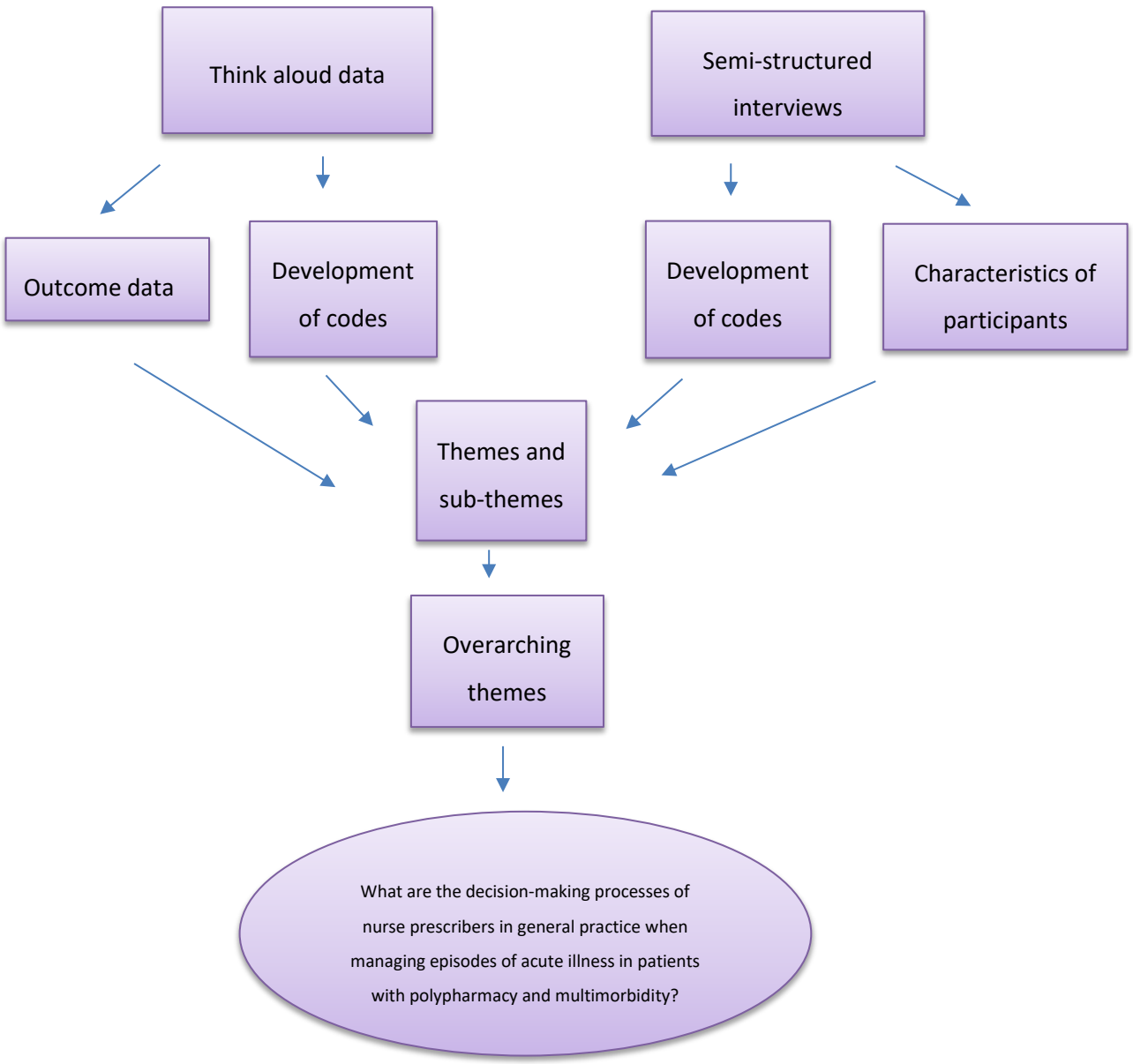
This data was then considered alongside the findings from the think aloud data and interviews to make judgements about the impact of the decision-making processes used on the quality and content of participants' decision-making.

3.9.5 Triangulation

Triangulation can be described as the process of using different data sources or methods to confirm, or in some cases refute, findings from the data (Creswell, 2009; Topping, 2015). In this study interpretation of the findings were made from both think aloud and interview data. Different representation of codes was used to support the development themes. In addition, data were collected to describe the participants and their setting and quantification of some data was used to enhance understanding of themes and sub-themes.

This process is summarised in Figure 12 below

Figure 12 Flowchart of theme development



3.10 Reflexivity

Reflexivity, or acknowledgement of the influence of the researcher's perspective is of key importance in upholding the confirmability of qualitative research findings (Lincoln and Guba, 1985; Tappen, 2011). Making this perspective transparent allows the reader to understand the context of the research and the relevance and applicability of the findings to other settings (Dodgson, 2019). Identifying whether the researcher holds the position as an 'insider' in the research process who shares the experiences of participants, or as an 'outsider' who has no personal experience of the research area needs to be made explicit as this has potential to influence the relationship with participants and their willingness to share information (Berger, 2015). From the outset I was aware that my experience as a general practice nurse prescriber with knowledge of the research area gave me 'insider' status and as such would impact on the research process. Overall, this could be seen as an advantage and holding this position gave me insights into the research area which meant that I could easily relate to and interpret participants' experience. In addition, having clinical contacts facilitated the recruitment of participants. However, with this position comes the risk of researcher bias in which pre-existing beliefs are not challenged and the researcher fails to look beyond their experience (Dodgson, 2019).

Conversely my role as a university tutor had the potential to give me outsider status. A few participants were seen to be anxious during the process and there was a sense that they were afraid of making incorrect or inadequate decisions. One participant expressed the view that the process felt like a test. Dodgson (2019) described the risk of a power imbalance between researchers and participants. This occurs where the researcher is seen as the expert and the participant takes part in the process but has little control over the outcomes of the research. Efforts were made at the start of the interviews to reassure participants that the purpose of the research was to explore their decision-making processes rather than test their abilities to complete the vignettes but even so this remained a concern for some participants.

Measures were taken throughout this study to minimise researcher bias, for example, the review of vignette construction by clinical experts and review of study themes by the supervisory team. In addition, a reflective diary was kept during the process of data collection and analysis. Topping (2015) advised that the use of a reflective diary can assist in the maintenance of reflexivity by allowing the researcher to reflect on and monitor their impact on the process. The use of a diary highlighted several areas where my clinical experience risked impacting the process. First, some

participants wanted to engage in clinical discussions and ask my opinion as to their proposed actions. Participant 4 was anxious about her decision-making and asked me at the end of two of the scenarios what I would have done:

> *P: At that point because I'm thinking it's more heart failure. If I saw him in ED* (previous employment*), I don't know it might be that they'd do fluid balance and maybe start, but it doesn't matter because it's primary care. What would you do?*
> *Interviewer: With that one? Well, this isn't really about what I'd do.*
> *P: No, I know.*
> *Interviewer: But I would be thinking the same as you and exploring what to do with his meds and things. But I would have probably come to the same conclusion as you.*
> *(Participant 4, vignette 3)*

I found this challenging and whilst not wanting to engage in a clinical discussion and influence her decision-making I was aware that she was looking for reassurance. I tried to give this whilst remaining as neutral as possible as I realised the importance of maintaining her confidence to complete the remaining two vignettes.

Participants generated interesting discussion from the interview questions, and I had to ensure I maintained a researcher role and prompted the conversation and resisted the temptation to engage in the discussion to ensure that their views of participants were truly represented. Using a reflective diary was helpful in maintaining neutrality as it heightened my awareness of these issues prior to the interviews and helped ensure that I did not get drawn into distracting conversations.

During the data analysis phase I was aware of the need to keep referring back to the data to ensure that this process was not influenced by impressions created from the interviews or by my existing beliefs, and that the data were accurately represented. For example, following the interviews I had created impressions regarding participants who appeared to show more expertise in completing the vignettes than others, particularly where they addressed issues that held particular interest for me. Reflecting on this and rigorous analysis of data including outcome data and tables to represent the content of consultations for each participant across all four vignettes was protective against this.

Reflexivity and the ability to think critically and be self-analytical are therefore vital to the quality of qualitative research studies (Tappen, 2011). Measures have been taken in this study to ensure reflexivity is maintained and that the position of the researcher is clearly stated.

Chapter 4 Findings

4.1 Introduction

This chapter will present the findings and discuss their contribution in answering the research question:

What are the decision-making processes of nurse prescribers in general practice when managing episodes of acute illness in patients with polypharmacy and multimorbidity?

It will aim to analyse the findings from the both the vignette responses and participant interviews in order to characterise and describe the decision-making processes of participants in response to the vignettes and consider how they explained and justified their decision-making. This chapter will start with a description of the participants followed by a discussion of the structure of their consultations. An overview of participants' decisions in response to the vignettes will then be presented followed by an analysis of the decision-making processes used by participants in response to the vignettes. This will conclude with a discussion of the contributory and influencing factors on these processes as expressed in the interviews.

4.2 Participants

Table 12 below summarises the demographic data, experience and qualifications of participants.

Table 12 Summary of participant characteristics

		Participants (all female)
Age range	35-44	1
	45-54	7
	55-65	6
Number of years as NMP	<3 years	2 (Participants: 9,11)
	3-10 years	6 (Participants: 1,2,4,5,12,13)
	>10 years	6 (Participants: 3,6,7,8,10,14)
Number of years in ANP role	<3 years	5 (Participants: 4,8,11,13)
	3-10 years	5 (Participants: 1,2,3,6,9,12)
	>10 years	4 (Participants: 5,7,10,14)
Total years primary care experience	<3 years	0
	3-10years	4 (Participants: 4,8,9,11)
	>10 years	10 (Participants: 1,2,3,5,6,7,10,12,13,14)
Post registration qualifications	MSc	3
	Post registration degree	4
	Individual modules*	6
	Post registration diplomas	6 (in addition to modules/post reg degree)
	No relevant post registration qualifications	1
*Includes university modules: Advanced Health Assessment and Diagnosis, History Taking and Physical assessment, Diagnostic Assessment and Decision Making, Research Methods for Evidence Based Practice, Transition to Advanced Practice, Minor illness module		

All participants were female and came from four CCGs across the Wessex region. They represented a group with considerable nursing experience (Table 13) with the majority of participants having been qualified for over twenty years. There was a wide range of prescribing experience ranging from two to seventeen years, but the majority were experienced prescribers with eight participants having ten or more years of experience as prescribers.

4.2.1 Clinical experience

In addition to experience in the ANP/NP role in general practice, many participants had significant primary care experience ranging from practice nursing to walk-in centres and community nursing roles (Table 13). These were experienced nurses who had acquired considerable primary care experience prior to taking on their current ANP/NP roles.

Table 13 Clinical experience of participants

Clinical experience	Number of Participants	Participants													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Practice nursing	7	x		x		x				x	x		x	x	x
Walk-in centre, Minor Injuries Unit	3				x		x		x						
Out of hours	1							x							
Emergency department	7				x		x		x	x	x	x		x	
Secondary care medical	9	x		x	x		x		x		x	x	x		x
Secondary care surgical	9	x	x	x		x		x	x	x	x			x	
Intensive care	5	x		x		x				x		x			
Community nursing	2		x					x							
Specialist community team	2		x											x	
Research	2					x							x		
Nursing home	1			x											
Hospice	1												x		
Cruise ships	1									x					
Psychiatry: acute and community	1							x							
Prisons	1													x	
Other: Staff development, matron: health and wellbeing, site/bed manager	3					x					x	x			

4.2.2 Role

Determining the length of time participants had been working in the advanced nurse practitioner/nurse practitioner (ANP/NP) role in the GP setting was complex due to the lack of clear role definition and inconsistent application of job titles. Furthermore, the roles of some general practice nurses had evolved over time, making it difficult to determine the point at which their role changed from one of practice nursing to a role that included diagnosing and managing acute presentations. Some participants did not hold a prescribing qualification when they were first in the ANP/NP role; however, they overcame this by making prescribing recommendations to the GP, an arrangement typical of many general practice nurses undertaking minor illness clinics. This was seen to represent similar processes of diagnostic and prescribing decision-making and, therefore, it was decided that the number of years spent in the ANP/NP role would be defined as the length of time spent in a role involving patient assessment of non-differentiated acute presentations and undertaking decisions regarding their management but did not necessitate the participant being an independent prescriber.

There was a wide variation in the length of time participants had been in the ANP/NP role, varying from six months to twenty years. Most participants described themselves as 'nurse practitioners' whilst others used the term 'advanced nurse practitioner' (Participants 1,3). This did not necessarily correspond to associated qualifications or the scope of the role. For example, although two participants had master's level qualifications and referred to themselves as 'advanced nurse practitioners', another participant who also had a master's level qualification referred to herself as a 'nurse practitioner'. Two participants (Participants 5,9) who were both from the same practice defined themselves as 'nurse practitioners' and differentiated themselves from the advanced nurse practitioners within the same practice in terms of their scope of practice and had attempted to restrict the range of conditions that were assigned to their clinics.

Table 14 below summarises the experience of participants in order to give a sense of the relative range of experience within their ANP/NP role, as prescribers and in the primary care setting. Benner (1984) judged competency to be achieved after approximately three years in a role so this was used as a cut-off point to identify those participants with less experience. This suggests that half of the participants were experienced and could be considered as at least competent both as prescribers and within their ANP/NP role

Table 14 Range of participant experience

Experience (**Experienced = >3 years)**	**Participants**
Experienced prescriber AND *Experienced ANP/NP role AND	1,3,6,7,10,12,14
Experienced prescriber AND **NEW** to ANP/NP role AND Experienced primary care	2,8,13
Experienced prescriber AND **NEW** to ANP/NP role AND **NEW** to primary care	4
Inexperienced prescriber AND Experienced ANP/NP role	5,9
Inexperienced prescriber AND **NEW** to ANP role AND Experienced primary care	11

*Where the participant was experienced as an ANP/NP they were assumed to be experienced in primary care

4.2.3 Characteristics of clinics

Some participants only undertook urgent clinics (Participants 1,3,4,6,8,10,13) whilst others had additional roles in the practice. Participants 5 and 9 undertook a range of practice nurse clinics and both Participants 9 and 11 ran respiratory clinics. Participants 7,12 and 14 had additional routine appointments and Participants 2 and 12 undertook home visits.

Most of the participants' clinics were run on an appointment basis with the majority having booked appointment times of 10 to 15 minutes. Participants 10,12 and 13 worked from a patient list shared with other members of the team from which they selected their patients and

consequently there was no definitive appointment time and a recognition that some consultations may take longer than others.

> *'And the reason they set it out like that is knowing that one of us was most likely going to be trying to refer someone or waiting on a phone somewhere. One of us would always be held up at some point in the morning and worst-case scenario all three of us, which happens sometimes as well.' (Participant 13, interview)*

Participant 2 was the only participant to be allocated 20 minutes for each patient consultation which was longer than her colleagues

> *'I'm a bit slow. Actually, it could be 20 (minutes) if I was honest because I am quite slow. I say I can't do it in 10 minutes. Also, I don't know whether it's because I'm a nurse or whether I've come from an urgent care background I tend to… I'm holistic, I am always thinking.' (Participant 2, interview)*

4.2.4 Qualifications

Only three participants had a relevant full master's level qualification (P1,3,12), two of which were in Advanced Clinical Practice (ACP) (P1,12). Two participants (P11, 13) were near completion of the ACP Master's programme with the dissertation remaining to be completed. All participants had undertaken additional training to support their prescribing and their role, for example university modules such as diagnostic decision-making or history taking and physical assessment or nurse practitioner degrees, but the level, currency and content of this training varied widely between participants.

4.2.5 Summary

Overall, this was a group of experienced prescribers the majority of whom had considerable primary care experience. There was no single common trajectory to the ANP/NP role. For some the transition to the ANP/NP role had evolved through working as a practice nurse and for others it was a new role that they had undertaken, for which they drew on previous experience from other settings. There was no uniformity to their qualifications, but most had undertaken some additional training to support their role; however, only three participants held a full master's level qualification.

4.3 Structure of consultations

All participants were found to follow a basic structure of history, examination, diagnosis and management/treatment, but the scope and content of the consultation varied between participants. Consultations were analysed to identify the content and order of cues collected and judgements/decisions made by each participant in response to each vignette. This was represented pictorially, and an example shown in Appendix O.

The content of the consultations varied markedly between participants with some identifying and collecting more cues and making more judgements and decisions than others. Across all four vignettes the range of cues and judgements was similar; typically between 10 and 24 of both cues and judgements were collected by participants for each vignette with the average number collected across all four vignettes being 16.

The consultation was not a linear process with participants revisiting the history and examination stages frequently. The fluidity of this process is described by Participants 9 and 2 below

> *'I take the history in quite a chatty way usually and we flit backwards and forwards. I'm not particularly structured but I'm aware that I follow a structure to it, so I am taking their past, present and other complaints, but I flit backwards and forwards between it and then I do tend to always come back and clarify with them, and I will revisit some areas several times during a consultation.' (Participant 9, interview)*

> *'Obviously, the history taking. I do use that a lot and I know sometimes I tend to maybe think to myself afterwards you could probably history take better. I tend to, instead of when you are told, you are told in a way and I have sometimes thought whether I should have a little template for myself, but I figure this is just how I am, this is how I do it. So, my history taking might be a little bit ask backwards sometimes. So I wish I could be a bit better at that.' (Participant 2, interview)*

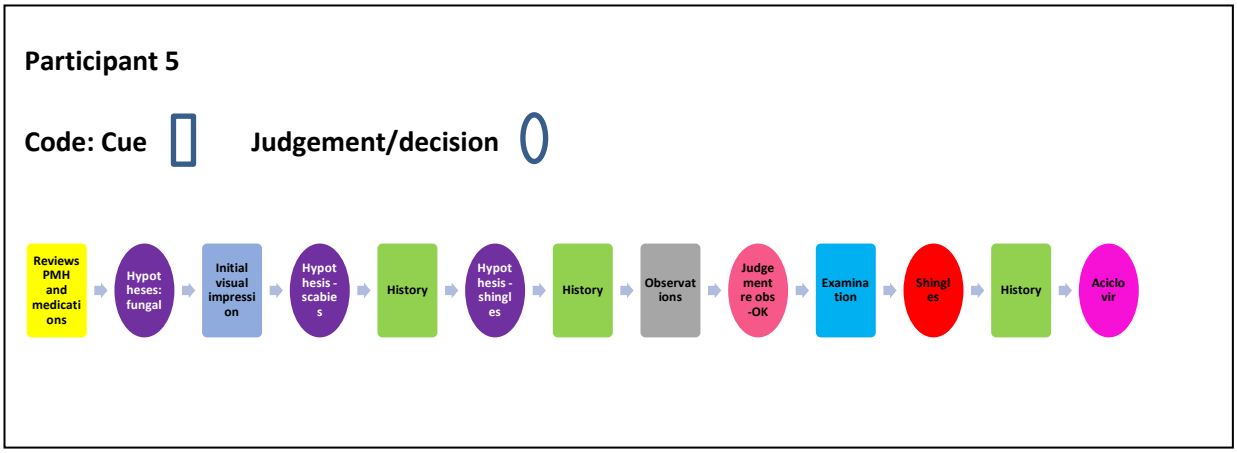
Two participants (P3,11) referred to the use of consultation models in respect of structuring their consultations but no longer used this in a formal or deliberate way

> *'I used a model for a long time. And now I do it automatically so OLDCART was one thing that I used so I didn't miss anything, but they went on to show me some of the medical models that they use, that I use a combination of the two and I used to always have it scripted so I would have cards with don't forget to ask this, don't forget to ask that.' (Participant 11, interview)*

> *'No, I'm afraid I don't* [structure consultations*]. I've done Neighbour's* [consultation mode] *and everybody else's but I don't knowingly do it, I'm sure I do, I bring them in and make them feel comfortable. No, I assess the person and see what's needed.' (Participant 3, interview)*

Figure 13 shows the analysis of the structure of the consultation of Participant 5 in response to vignette 1 and the fluidity of the process is demonstrated by the revisiting of the history taking phase.

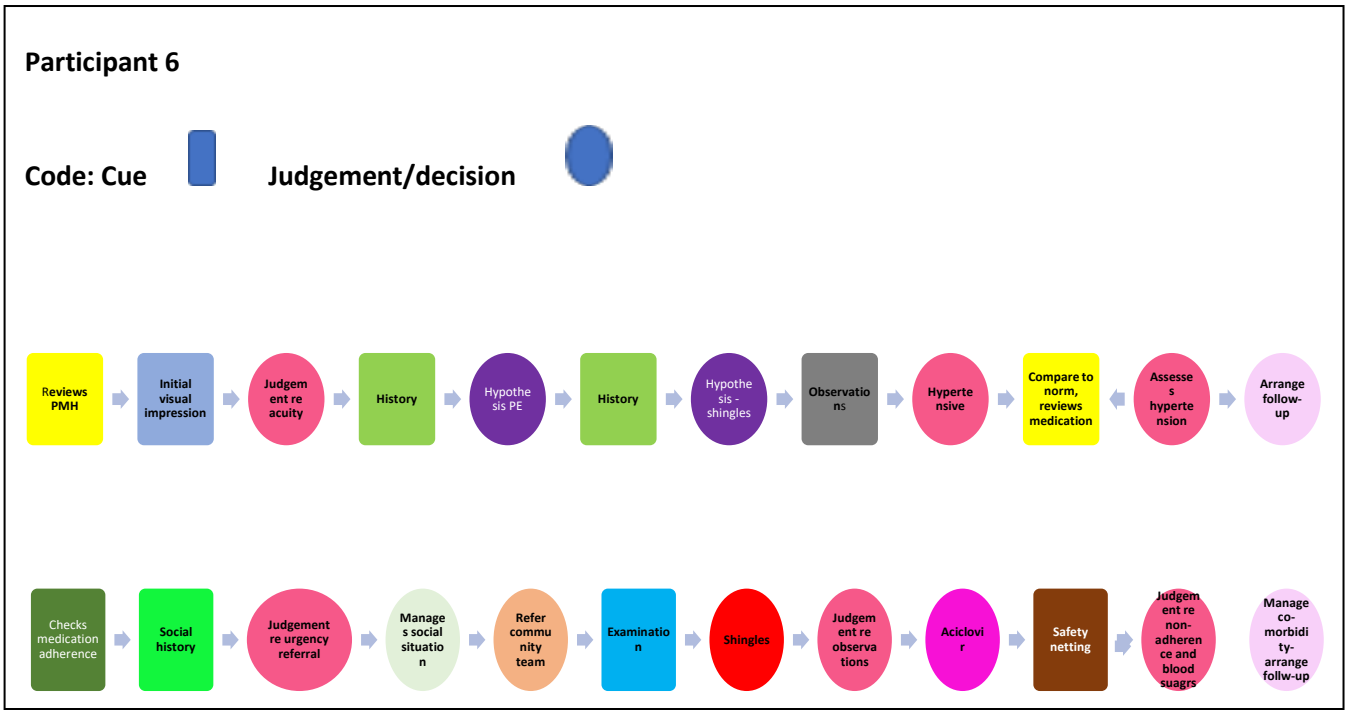
Figure 13 Structure of consultation: participant 5, vignette 1



Participant 5 is shown to have collected a number of cues which were taken from reviewing the patient's notes, visual appearance, history and examination. These were then interpreted through a sequence of judgements and further cues were collected until the final diagnostic and prescribing decisions were made.

All participants focused on the presenting complaint, but there was variation amongst participants in their identification and management of features of complexity with some taking a more comprehensive approach than others. This is demonstrated by comparing the analysis of decision-making processes of Participant 6 in vignette 1 shown in Figure 14 below to that of Participant 5 in vignette 1 (Figure 13).

Figure 14 Structure of consultation: participant 6, vignette 1



This clearly shows Participant 6 collected a wider range of cues than Participant 5 which included social history and medication adherence and additional judgements and decisions were made regarding the observations of vital signs, social factors and management of co-morbidities.

4.3.1 Structure of prescribing decision-making

The structure of prescribing decisions was analysed separately and an example of analysis of the structure of participants' prescribing decisions in response to vignette 1 is shown in 0.

Participants undertook a sequence of decisions: to treat or not to treat, the choice of drug and the dose and regime. Overarching this was the decision whether to undertake the prescribing decision independently. All participants used electronic prescribing which alerted the prescriber to allergies and potential interactions and automatically added a safety net to the prescribing process

> *'If I would go to prescribe the Acyclovir there (*types on computer, checks spelling*) there we go, and then I would go to either the BNF or information here and then I would look, so he's how old? 73 (*types on computer*) there we go 12-18 so it's 800mg five times a day for 7 days.' (Participant 11, vignette 1)*

*'Yes, well, I'd put it into the system which very cleverly would start pinging me the red, yellow, the EMIS red, yellow or white (*computer alerts*) to be aware of.' (Participant 13, vignette 1)*

Figure 15 represents the basic structure of the prescribing process undertaken by most participants.

Figure 15 Structure of prescribing decisions

Similar to diagnostic decision-making there was considerable variation in the complexity of decision-making between participants with some undertaking a prolonged process of checking and accessing supporting information whilst for others the drug to be prescribed was quickly recalled and entered into the computer (0).

4.3.2 Determining the content of the consultation

A marked difference was shown in the content of consultations between participants in particular with regard to their attention to complex factors within the consultations.

4.3.2.1 Attention to complex factors

Overall, issues of complexity such as adherence to medication, management of co-morbidities and medication review were not routinely addressed in consultations, with the majority of participants relying on cues such as observations of vital signs (observations) to prompt further exploration, but even so, these cues were not always explored beyond the context of the presenting complaint. Participants' primary focus was to make a diagnosis based on the patient's presenting complaint which was reflected in the range of information gathered. Despite this there were some instances where cues within the vignettes prompted some participants to consider more complex issues.

Table 15 below shows a summary of complex factors identified by participants within the vignettes.

Table 15 Complex factors identified

	Social situation	Management co-morbidities	Medication adherence
Vignette 1	9 Participants (2,4,6,7,9,10,12,13,14)	5 Participants (2,6,10,13,14)	6 Participants (2,6,10,12,13,14)
Vignette 2	3 Participants (1,2,14)		2 Participants (1,2)
Vignette 3	3 Participants (2,7,13)		3 Participants (2,7,13)
Vignette 4	10 Participants (1,2,4,5,7,9,10,12,13,14)	6 Participants (1,3,6,7,814)	1 Participant (P1)

4.3.2.2 Observations as cues to explore complexity

Observations were shown to be an important cue to prompt consideration of complex issues. However, abnormal observations did not act as a cue to explore complexities for all participants. There was a distinction between those participants who reviewed abnormal observations solely in the context of the presenting complaint and those for whom it triggered consideration of additional factors such as co-morbidities and medication adherence. This is exemplified in the quotes below in which Participant 5 considers the patient's out of range observations in vignette 1 in the context of his presentation of shingles, whilst participant 4 notes the patients raised blood pressure and is prompted to consider the patient's adherence to their medication.

> *'His obs are fine. Blood pressure is up a bit. His blood glucose is a bit up and his SATS are down a bit. How old is he? 74. So that to me wouldn't be ringing too many alarm bells. (Participant 5, vignette 1)*

> *'Yes, so he's apyrexial pulse is fine, his blood pressure's raised so then I would ask him if he's been taking all the medication he's been prescribed and if he wasn't taking the amlodipine if there was a reason for it.' (Participant 14, vignette 1)*

This highlights the difference between a problem focused approach, where observations were interpreted in the context of the patient's presenting complaint, in contrast to a consultation with

a broader scope in which observations were interpreted in the context of wider issues regarding the patient's health status. This inconsistent response to cues such as observations to explore issues of complexity raises issues of patient safety where important information may be missed. Furthermore, in vignette 1, five participants (Participants 3,7,8,9,12) did not undertake any observations, and were consequently never exposed to this cue.

4.3.2.3 Exploration of social situation

Most participants relied on visual cues to prompt consideration of the impact of social factors on the consultation. This was apparent in vignette 1 where cues from the visual inspection of the patient prompted most participants to explore the social situation of the patient and make plans to address this.

> *'I suppose I'm thinking about the unkempt appearance I'd be thinking has anything changed at home. Does he live alone? Anything else changed for him recently.' (Participant 7, vignette 1)*

> *'So, yes, I might investigate a bit more about that and ask him why has he not got any support and does he want any more support?' (Participant 4, vignette 1)*

Social factors were also considered by the majority of participants in vignette 4. However, this was mostly explored in response to discharge plans and participants weighed up how safe it was to discharge the patient home.

> *'Probably doing a bit more safety netting, she's come with her daughter so I'd ask a little bit around um does your daughter live nearby or with her, (*reads card*), lives on her own, in warden, good, daughter visits daily, even better, love it, so she's got some support network there.' (Participant 10, vignette 4)*

Social factors were not routinely addressed within the consultations but explored in response to particular cues that arose. An explanation for this was voiced by Participant 6 in response to vignette 2.

> *'Also, with him I don't know whether I'd look at his social life, I don't know. I know in the ideal scenario when you are doing this as part of your research, I think all of us if we were honest, you know you've got ten minutes with somebody. So unless things flag up like the other guy, he's unkempt and he's not taking his medications it's an obvious thing, with him if nothing is flagged I can't say you know, that he's not, you know...' (Participant 6, vignette 2)*

4.3.2.4 Medication review

Some participants took the opportunity to review the patient's medication to identify areas of risk. This was a highly analytical process done both in the context of the patients presenting complaint and more generally by a very few participants. Table 16 below summarises issues identified by participants.

Table 16 Summary of medication optimisation

Medication: area of risk	Participants
Pt taking over the counter ibuprofen: risk to elderly and interaction with warfarin (V2)	P 1,2,3,9,12,14
Bendroflumethiazide (risk factor for gout) (V2)	P12,14
Seretide: review dose (V3)	P13,14
Prednisolone: review/monitoring (V4)	P1,7,14

It is clear from this table that there was a lack of consistency between and within participants in their attention to reviewing existing medication within the vignettes. This may reflect particular areas of knowledge for each participant but notably for participant 14 medication review appeared to be an integral part of her consultations.

4.3.2.5 Co-morbidities

In both vignettes 1 and 4 despite there being indicators that comorbidities were poorly controlled; these were not identified by all participants, and this was largely reliant on participants identifying cues from the observations and considering these beyond the context of the acute presentation.

> *'Blood pressure's up and I'd want to re-check that when she was better, um, I don't tend to sort of react too much if their blood pressure's up when they're unwell cos I would expect that, but definitely I'm not happy with that blood pressure being diabetic.' (Participant 1, vignette 4)*

Undertaking observations of vital signs was routine practice for the majority of participants.

> *'I always do obs* (observations*), just as a standard course.' (Participant 13, interview)*

These were identified as important cues in prompting some participants to consider issues of non-adherence to medication and sub optimal control of co-morbidities. Undertaking observations required a judgement to be made as to whether they were within acceptable limits. Where they were considered abnormal, additional judgements were required to consider the cause of this abnormality and subsequent management.

> *'So, then I would do the observations. His blood pressure is elevated, and he's on Amlodipine 10mgs. So, then I would have a look when he last had his blood pressure checked because if he had it done last week, and it was 130 it could just be that he's a bit tense. So if I can't see any other blood pressure problems and he's feeling well and he's got no headache or anything I'd either send him for 24-hour tape which I can click a button for and he'll get.. or I'll bring him back to get the healthcare assistant to check it. But I wouldn't do anything immediate about that today actually if he felt alright. I know that probably in some literature somewhere there would be that you should, but this is real life. So, I would check that he's definitely compliant with all his medications and he's definitely taking his anti-hypertensives.' (Participant 6, vignette 1)*

4.3.2.6 Identifying non-adherence to medication

Non-adherence to medications was identified inconsistently by participants who mostly relied on cues from the consultation to prompt exploration of this.

Review of the patient's raised blood pressure in vignette 1 acted as a cue in identifying medication non-adherence for six participants (Participants 2,6,10,12,13,14) whilst in vignette 4, where the patient also had raised blood pressure, medication adherence was only explored by one participant (Participant 1). This suggests that either participants did not identify the out of range blood pressure in vignette 4 or other factors within vignette 1 such as the patient's social situation may have heightened the impact of the out-of-range observations in vignette 1, prompting participants to think more widely.

In vignette 3 identifying the patient's non-adherence to medication was a key diagnostic cue where non-adherence to diuretics had triggered decompensation of the patient's heart failure. However, this was only identified by three participants (Participants 2,7,13) and was prompted by

the cues of cough and inhaler for two participants (Participants 2,7) leading to consideration of issues of medication adherence.

> *'Oh OK. I would ask him how long he's had this cough for because he's had a bit of a cough. I'd be thinking here maybe x-ray, is there more to this than just short of breath? He's doing his inhalers. I would check are you doing all your meds properly? He says his inhaler hasn't helped. Adherence* (reading card), *manages his own meds, says he takes all his medication but mentions he doesn't take Bumetanide when going out and only takes one normally. OK. Right, so then I'd be thinking perhaps, hang on where is his past medical? He's got heart failure. OK. And you are not taking your Bumetanide properly?' (Participant 2, vignette 3)*

> *'So how different is this cough to his normal COPD cough? [reading card]. Which inhaler is he using? OK so making sure, is he taking his Seretide? Is he taking all his medicines as they are prescribed? Thank you. Ankles are more swollen. Says he takes all [reading card] doesn't take Bumetanide. Doesn't like that. Has he been out a lot lately? Has he been on any coach trips or anything exciting where he hasn't been taking his, how many days hasn't he taken Bumetanide?' (Participant 7, vignette 3)*

Only Participant 13 identified asking about non-adherence as a routine part of her consultations, but even so this was not done in all of the consultations.

> *'I didn't verbalise necessarily the adherence discussion I'd have had. I did in some, but I didn't in all four scenarios I don't think so. I know that that's actually something that I do tend to ask but what someone says and what someone does, amazing difference.' (Participant 13, interview)*

The examples above highlight the risk of relying on prompts to consider additional complex factors within the consultations, whereas in this vignette, uncovering the patient's non-adherence to medication was key to diagnosis and management.

4.4 Overview of participants' decision-making

This section summarises the decisions made by participants in respect of making a diagnosis, prescribing medications and seeking additional support with decision-making. All participants completed all four vignettes with the exception of Participant 1 who only completed vignettes 2,3 and 4. Initially it was planned for vignette 1 to be a trial vignette to enable participants to practice the process of think aloud. However, it soon became apparent that participants undertook the

think aloud process with ease and their responses to vignette 1 were of considerable value and interest. It was therefore decided, after Participant 1, to use this data in the analysis. Unfortunately, the data for Participant 1 was not retained as the decision had not been made at that stage (see 3.8.3.1)

4.4.1 Summary of diagnostic decisions

The majority of participants made anticipated diagnoses in response to the vignettes (V) (Table 17).

Table 17 Summary of diagnoses

	Diagnosis	
V1	Shingles	Other
(13 participants)	13	0
V2	Gout	Other
(14 participants)	11	P5: gout, osteomyelitis P9: arthritic flare, cellulitis, septic arthritis P11: cellulitis
V3	Heart failure	Other
(14 participants)	12	P5: Chest infection, pulmonary oedema P14: Heart failure, COPD exacerbation, lung cancer
V4	Chest infection	Other
(14 participants)	9	P4, P14: Pneumonia P10,13: Bronchitis P9: COPD

In four instances a definitive diagnosis was not made but participants considered several differential diagnoses prompting them to either refer to the GP (Participant 5: vignettes 2 and 3, Participant 9: vignette 2) or to manage the scenario independently whilst waiting for the results of investigations (Participant 14: vignette 3, Participant 11: vignette 2).

Most participants opted for the diagnosis of 'chest infection' in vignette 4 rather than applying more precise diagnostic labels such as pneumonia or acute bronchitis.

4.4.2 Summary of prescribing decisions

Analysis of participants' prescribing decisions showed that not all made decisions that were anticipated. Table 18 below shows a summary of prescribing decisions made by participants alongside guideline recommendations. Not all participants made prescribing decisions for all vignettes and chose to refer for advice at this stage. Anticipated prescribing choices are highlighted in green.

Table 18 Summary of prescribing decisions

V1 **Shingles:** Aciclovir 800mg 5 times a day for 7 days (National Institute for Health and Care Excellence, 2018)					
Prescription	Aciclovir 800mg 5 times a day for 7 days	Duration variation (5days duration)	No Aciclovir		
Participants	10 (P2,4,5,8,9,10,11,12,13,14)	2 (P3,6)	1 (P7)		
V2 **Gout:** Non-steroidal anti-inflammatory (NSAID) with Protein Pump Inhibitor (PPI) cover CAUTION with elderly and interaction with warfarin graded SEVERE increased risk of bleeding events (BNF 2020) OR or **oral colchicine** 500 micrograms 2-4 times a day. In elderly or eGFR 10-50ml/min reduce does or increase dosage interval (National Institiute of Health and Care Excellence, 2018a)					
Prescription	Colchicine 500micrograms Reduced frequency of dose	Colchicine 500micrograms 2-4 times/day	Ibuprofen	Codeine 30mg up to four times/day and paracetamol 1g four times/day	Flucloxacillin 500mg four times/day 7 days
Participants	4 (P3,6,8,12)	2 (P1,2)	2 (P4 dose not specified) P7 400mg 6 hourly increase PPI)	1 (P14)	1 (P11)
V3					

Decompensated heart failure: Titrate diuretics to relieve congestive symptoms and fluid retention (National Institute for Health Care and Excellence, 2018)			
Prescription	Titrates diuretic	Stops ramipril	Stops amlodipine
Participants	0	P3	P14

V4 **Acute Lower Respiratory Tract Infection (LRTI)** Acute bronchitis: Amoxicillin or doxycycline (Clarithromycin 2nd line) Community Acquired pneumonia: Amoxicillin or doxycycline or clarithromycin Chronic obstructive pulmonary disease exacerbation: Doxycycline or clarithromycin Chest infection/LRTI		
Prescription	Doxycycline	Clarithromycin
Participants	8 (P1,4,6,7,9,11,12,13)	4 (3,8,10,14)

In both vignettes 1 and 4 the majority of participants made anticipated prescribing choices that were in line with evidence-based guidelines. However, in vignette 1 there were two instances of potentially suboptimal prescribing decision-making in respect of the duration of Aciclovir and whether to treat the patient with antiviral medication. In vignette 4 all participants made prescribing decisions consistent with local antibiotic guidelines. Although it was anticipated that participants would diagnose the patient with Acute Bronchitis and therefore doxycycline would be the optimal choice of treatment (North Hampshire Clinical Commissioning Group, 2018), reality showed the precise diagnosis in this vignette to be more subjective than anticipated and participants opted to use the diagnostic term 'chest infection'. Consequently, there was more variation in participants' antibiotic choices, but even so these were consistent with guideline recommendations which allowed flexibility in the choice of antibiotic (North Hampshire Clinical Commissioning Group, 2018).

In vignettes 2 and 3 fewer prescribing decisions were made overall with some participants referring for support at this stage in the consultation. Ten participants completed vignette 2 independently with only four making anticipated prescribing decisions. Five participants made decisions that could be considered suboptimal, and this reflects the more complex prescribing decision-making experienced by participants in respect of this vignette.

None of the participants made anticipated prescribing choices in vignette 3. Most referred the patient to the GP and considered prescribing for this condition to be outside of their scope of

practice. Five participants managed the patient's presentation independently, three of whom (Participants 1,7,8) sought advice from specialist practitioners but did not require the support of the GP to do this, whilst two participants (Participants 3,14) made prescribing decisions without seeking advice or support. However, these decisions did not directly treat the patient's presenting complaint but instead were aimed at treating the patient's hypotension. This approach revealed incomplete history taking in which non-adherence was not identified.

This assessment of prescribing decision-making reflects the difficulty experienced by the participants in respect of each vignette. It is clear that vignettes 1 and 4 represented more straightforward prescribing decisions for participants than those required to complete vignettes 2 and 3 in which there were increased incidences of prescribing decision-making that could be considered suboptimal. In particular, vignette 3 was found to be challenging to participants with most not attempting to undertake prescribing decisions independently and only a small minority making suboptimal prescribing decisions.

4.4.3 Summary of referral decisions

The area of most difficulty for participants across the vignettes was the decision-making associated with the management of the patient's condition, which was reflected in the increased referral rate to the GP at this point. Determining the management of the condition, which for all the vignettes involved prescribing medication, represented a key point at which participants reviewed whether they felt competent to prescribe independently.

> *'Even though sometimes you might feel confident with what you're diagnosing you don't necessarily feel as confident with your prescribing.' (Participant 9, interview)*

Despite this, with the exception of vignette 3 which proved challenging for the majority of participants, most vignettes were completed independently (Table 19). However, there was variation both amongst participants and across vignettes in their ability to independently complete the episodes of care presented in the vignettes.

Table 19 Level of participant independence in completion of vignettes

	V1 (13 participants)	V2 (14 participants)	V3 (14 participants)	V4 (14 participants)
Completed independently	12 (P3,4,5,6,7,8,9,10,11,12,14)	9 (P2,3,4,6,7,8,11112,14)	2 (P3,14)	10 (P3,4,6,7,8,10,11112,13,14)
Completed independently but makes plan in conjunction with specialist team or secondary care	0	0	3 (P1,7,8)	0
Refer/liaise with GP for management	3 (P2,13 advice re hypertension)	5 (P1,5,9,10,13)	9 (P2,4,5,6,9,10, 11,12,13)	4 (P 1,2,5,9)

Referral decisions are further analysed in Table 20 below which shows whether referral to the GP was due to the overall management of the case proving too complex or because of specific prescribing complexity within the vignettes.

Table 20 Analysis of reasons for referral to GP

	V1	V2	V3	V4
Refers overall management	0	3 (5,9,10)	8 (P4,5,6,9,10,11,12,13)	1 (P5)
Refers due to prescribing complexity	2 (P2,13) Hypertension	2 (P1) Warfarin interaction (P13) Colchicine	1 (P2) Diuretic	3 (P1,2) Warfarin interaction (P9) Prednisolone

This clearly shows vignette 3 to be a scenario which the majority of participants considered to be outside of their scope of practice.

4.5 Diagnostic decision-making processes

This section will present the findings related to the theme of diagnostic decision-making processes. Several sub-themes were identified which characterised the diagnostic decision-making processes of participants.

4.5.1 Recognising patterns

Analysis of the vignettes showed the recognition of patterns to be a key element of participants' diagnostic decision-making. Participants recognised familiar patterns from clustering cues from the history and examination which prompted them to make an intuitive judgement regarding the patient's presentation.

> *'And he'd say OK I've got a pain in the right side of my chest; I've had it for a week and I've got spots on the right side of his chest over the last few days. Painful. Do you want my thinking straight away? Shingles.' (Participant 2, vignette 1)*

Participants did not access any resources to support their diagnostic decision-making and relied on their own knowledge and experience to generate diagnoses. Pattern recognition was identified by some participants as representative of their diagnostic decision-making.

> *'I suppose when you are looking to make diagnosis you are looking at patterns. So, you are looking for historical patterns and you are looking for clinical patterns. And you put those together.' (Participant 8)*

The intuitive nature of pattern recognition was exemplified by participants' use of language. Participants used phrases such as 'straight away' (P2, V1) and 'immediately thinking' (P5, V1) when referring to their generation of diagnoses.

Pattern recognition was the dominant diagnostic process in vignette 1. In this vignette participants hypothesised about a range of diagnoses based on cues from the pre-encounter information (patient notes and reason for attendance) and the initial visual inspection of the patient. In the quote below Participant 5 is seen to cluster the cues of 'unkempt, loose clothes and poor hygiene' which she appears to recognise as a pattern representative of someone with scabies.

> *'OK, so he looks well, quite well perfused, no apparent distress, bit unkempt, clothes loose, not washed. OK. So immediately then I'm thinking has he got scabies. (Participant 5, vignette 1)*

However, these first impressions were not always correct and awareness of this was apparent in the participants' persistence in collecting cues. Participants continued to collect and cluster cues from the patient's history from which they instantly recognised features representative of a diagnosis of shingles. In the extract below Participant 10 recognises a pattern representative of shingles from the cues of pain, spots and unilateral distribution.

> *'Onset of pain a week ago spots have come out on the right side of his chest so straight away you're starting to think of differentials so I'm thinking possible shingles at this point.' (Participant 10, vignette 1)*

Despite this recognition, participants continued with a more analytical process of collecting cues in the form of observations of vital signs and physical examination; however these were largely to confirm the diagnosis rather than to consider alternative diagnoses. The extracts below show Participants 9 and 6 recognising patterns from findings from the history to form the diagnosis of shingles and looking for confirmatory signs in the examination.

> *'So, initially the history of pain to the right side of the chest one week ago already in my head I'm thinking shingles straight away. The fact that his spots have come up on the right side of his chest in the past few days I would have a look at them to see if they were vesicles and looking at the picture here …Yeah. So, on seeing this gentleman I would assume that this is shingles.' (Participant 9, vignette 1)*

> *'So going back to his initial complaint I would next up need to look at the rash.*
> *OK, yes, it's what I was thinking. It's just on one side, unilateral, yes?*
> *So I would say he's got shingles as long as all his obs are fine.' (Participant 6, vignette 1)*

The decision-making processes for this vignette differed from the other vignettes in the ease of recognition of the diagnosis from the pattern of cues from the history and examination.

4.5.2 Hypothesis testing

Pattern recognition was also a feature of the participants' diagnostic processes in vignettes 2,3 and 4, but it was apparent that reaching a diagnosis was more complex in these vignettes and after generating initial hypotheses based on the recognition of patterns, a more analytical process of differential diagnosis (a systematic process of narrowing hypotheses (Sox, Higgins and Owens, 2013)) and hypothesis testing was undertaken. In order to test hypotheses participants looked for cues that either increased or decreased the likelihood of a diagnosis until they arrived at a working diagnosis.

The extract below shows how Participant 4 generated an initial hypothesis by recognising patterns from the clustering of cues from the history and examination and then continued to consider differential diagnoses which included two 'must not miss' or serious diagnoses (deep vein thrombosis (DVT) and pulmonary embolism). Consideration of serious diagnoses were prompted from cues within the consultation which in this instance were red, swollen foot, generating the possibility of a DVT and then consideration of the sequelae which prompted the possibility of a pulmonary embolism.

> *'Well, I'm thinking it could be a cellulitis if he's got sudden onset 24 hours ago, red swollen right foot. And it's quite painful. He's describing it's in the foot so I'm thinking it could be a cellulitis, I might want to ask a bit more to make sure it's not a DVT but people don't normally report it in their foot they do report it in their calf. Ask him if he's got any shortness of breath because his SATs were a little bit low and I'd re-record that. So, yes, I'm thinking it might be a cellulitis so I'd want to look at it. Ah so it could be cellulitis, it could be a bit of a gout as well but it's very red for a gout.' (Participant 4, vignette 2)*

These hypotheses were tested by considering their likelihood in the context of specific cues. For example, DVT was considered less likely because of the location of the signs and symptoms whilst pulmonary embolism was tested in the context of breathlessness.

Gout was considered less likely at this stage as the presentation did not match the participant's visual impression of the appearance of gout. Final hypothesis testing, shown in the extract below, demonstrates how Participant 4 persisted in looking for cues associated with infection in order to determine her final diagnosis.

> *'Hot to touch. It's come up in the last 24 hours, I would probably want to initially just treat it with elevation and non-steroidal and treat it as a gout because he's systemically quite well and he's not got any infection although it is hot to touch.' (Participant 4, vignette 2)*

This process was typical of the diagnostic process of participants. In vignette 2 the majority of participants sought to differentiate between the differential diagnoses of cellulitis and gout and cues from the patient's vital signs (observations), in particular the temperature and subjective 'wellness' of the patient, were key in ruling out an infective cause.

> *'So right here I want to take his temperature right away to see if he's got cellulitis because that's what I'm now thinking. Temperature is 36.8, he hasn't…. Pulse 70 regular. SATS are 96% so I'm really quite happy with all of those. So, I'd be assessing the pain and the swelling around it. One foot painful, worsened, really painful. Has he had it before? Has he ever had gout? (Participant 3)*

A similar process of distinguishing an infective cause versus decompensated heart failure was demonstrated in vignette 3 where participants considered key diagnostic cues representative of heart failure and lower respiratory tract infections (LRTI) to determine the most likely diagnosis.

> *'Using three pillows at night, inhaler not helping much although they don't often with the COPD do they? Sputum not changed so you are thinking not chest infection. Chest not sounding wheezy by the sound of it. And the fact that he's swelling up that would make you think maybe he's just filling up with fluid really.' (Participant 12, vignette 3)*

> *'Right. So, he's got COPD but no change in sputum and he has been more breathless, however at night when he's lying down using three (pillows), so I'm thinking perhaps it's more cardiac related by his swollen ankles and just the extra symptoms that he's expressed here.' (Participant 13, vignette 3)*

These examples are illustrative of the diagnostic process undertaken by participants who generated hypotheses (decompensated heart failure) from the clustering of cues to recognise patterns (breathless, swelling, use of pillows) and reviewed the likelihood of competing diagnoses (LRTI) by the presence or absence of key diagnostic cues (sputum change, inhaler not helping).

4.5.3 Differential diagnoses

Although participants made appropriate diagnostic decisions there was considerable variation in the range of hypotheses or differential diagnoses considered by participants across the vignettes (Table 21). Table 21 shows the range of differential diagnoses considered by participants and the number of participants who considered each. In addition, the anticipated diagnosis for each vignette is highlighted in green and diagnoses indicative of serious disease highlighted in red. There was some consistency amongst participants in respect of competing differentials in vignette 2: cellulitis or gout and vignette 3: heart failure or lower respiratory tract infection. However, beyond that there was little consensus.

Table 21 Range of differential diagnoses

Vignette 1	**Shingles**	**Scabies**	**Drug induced**	**Fungal**	**Malignancy**	**Self-neglect**	**Cardiac**	**PE**	**Alcohol**	
Participants	13	4 (P3,5,11,12)	3 (P3,10,12)	2 (P5,8)	1 (P4)	5 (P4,7,13,14)	1 (P4)	1 (P6)	1 (P8)	
Vignette 2	**Gout**	**Cellulitis/ infection**	**Septic arthritis**	**DVT**	**Cardiac**	**Arthritis**	**Diabetes/ arterial disease**	**Trauma/ stress fracture**	**Osteomyelitis**	**Vasculitis**
Participants	13 P(1,2,3,4,5,67,8,10,11,12,13,14)	14	4 (P6,9,11,13)	4 (P3,47,13)	5 (P3,4,5,7,12)	1 (P9)	3 (P5,10,12)	3 (P8,9,14)	1 (P5)	1 (P10)
Vignette 3	**Heart failure**	**Lower respiratory tract infection**	**MI**	**DVT**	**Atrial fibrillation**	**PE**	**Lung Ca**			
Participants	14	14	3 (P3,10,14)	2 (P3, 14)	1 (P12)	1 (P14)	1 (P14)			
Vignette 4	**Chest infection/ Lower respiratory tract infection**	**COPD**	**Community acquired pneumonia**	**Acute bronchitis**	**Malignancy**	**Drug induced**	**DVT**	**Pulmonary Embolism (PE)**	**Heart failure/ Cardiovascular cause**	
Participants	12 (P1,2,3,4,6,78,9,10,11,12,14)	2 (P8,9,11 12)	2 (P4,12,14)	2 (P13,10)	6 (P1,2,3,6,7,8,12)	2 (P3,12)	2 (P3,12,13)	3 (P4,10,13)	2 (P6,8)	

NB: Only 13 participants completed V1
Participants were given the information that there was no history of trauma in the patient history for V2, so may not have verbalised this differential
Serious diagnoses are highlighted in red
Anticipated diagnoses are highlighted in green. NB there is scope for interpretation of the diagnosis in Vignette 4

4.5.4 Diagnoses indicating serious disease

Within the range of differential diagnoses some participants were seen to identify diagnoses indicative of serious disease, but this was undertaken inconsistently by participants. These diagnoses are highlighted in red in Table 21. Differentials representing serious disease were generated by participants throughout the diagnostic process but even though all participants considered at least one, there was inconsistency in participants' attention to serious diagnoses within the consultations.

Two differentials indicative of serious disease that needed consideration within the scenarios were in vignette 2: septic arthritis and vignette 4: lung malignancy. Septic arthritis is an important differential diagnosis to be eliminated when considering a diagnosis of gout (National Institiute of Health and Care Excellence, 2018a) However, despite this, only four participants actively considered this (Participants 6,9,11,13).

> *'However, if it was extremely painful to move the joint then you've got a red-hot joint so it would change your pathway. But you would expect him to feel unwell as well so that could be all part of your safety netting. So, if he's feeling well and he can move the joint it's painful but I'm not thinking septic arthritis then I would treat him for gout.' (Participant 6, vignette 2)*

Six participants (Participants 1,2,3,6,7,8,12) considered a malignant cause of the patient's symptoms in vignette 4 in view of the patient's past medical history of breast cancer.

> *'I suppose things that stand out to me, so she's had Ca breast in the past, so you'd be slightly concerned had it gone to her lung.' (Participant 12, vignette 4)*

> *'I know she's got a history of Ca breast so that's in the back of the mind, but because this is a new onset chest infection and its related to a viral cold and she hasn't got any red flags in terms of chest pain or haemoptysis I would initially treat with a course of antibiotics and review her after that.' (Participant 1, vignette 4)*

Notably in the first example the participants actively looked for cues indicating serious disease (painful to move, feeling unwell) whilst in the second example participants were prompted to think of serious diagnoses from cues identified in the history (history of breast cancer). Overall Participants 3, 4 and 6 were the most consistent in considering red flag diagnoses, but even then, Participants 3 and 4 missed one or both of the key red flag diagnoses described above.

4.5.5 Intuitive processes in diagnostic decision-making

A distinction between intuitive processes based on nursing knowledge and experience, and the intuitive process of pattern recognition referred to in the diagnostic process was referred to by some participants. Experience was recognised as fundamental to the reliability of the application of intuitive processes to medical diagnosis and consequently caution was expressed in their application to medical diagnosis.

4.5.5.1 Pattern recognition

Three participants (10,11 and13) described the importance of a strong knowledge base and experience in order for intuitive processes exemplified by pattern recognition in the examples below to be reliable, a concept that was highlighted when they transitioned from a nursing role to the more medically focused prescribing role.

> *'I think you get intuitive about what it could be, I think that comes with experience. I'll come up with three or four differentials very quickly. Whereas when I reflect back on when I was in the early days of nurse practitioning I would be thinking it's a chest infection, it's a chest infection, it's a chest infection, whereas now I would be thinking it could be heart failure, chest infection, COPD, blood clot in the lung. You know, you've suddenly got a million things that come into it, which I think is more the experience of it.' (Participant 10, interview)*

Participants 11 and 13 reflected on the use of pattern recognition in their transition from a nursing role to the more medically focused NMP role. They described how they initially chose to suppress such intuitive responses as they took on their new roles and found that as their experience grew in these roles, perversely gaps in their knowledge base were highlighted and threw doubt on the reliability of pattern recognition to make diagnoses.

> *'I didn't trust what I saw. I didn't trust my knowledge bank of what I should be thinking of.' (Participant 13, interview)*

> *'I suddenly realised that relying on my heuristics and familiar situations wasn't enough and I was actually going to have to take a step back.' (Participant 11, interview)*

Participants 11 and 13, who were both relatively new to the prescribing role, discussed how, as they had developed their knowledge, they had become less wary of using pattern recognition in their decision-making and had begun to recognise their potential value in informing some of their decision-making.

'Yes, I do and I need to listen to them a little more now. I've been thinking that I don't have the exposure to allow myself to use them and then have taken myself off down the wrong road and then actually afterwards I've gone doh! I should have just listened to myself.' (Participant 13, interview)

4.5.5.2 Intuition

In addition to the intuitive process of pattern recognition, the concept of intuition or 'gut feeling' was referred to by some participants. This was referred to mostly in the context of forming an instinctive impression of the patient's condition or assessment rather than in the context of making a final diagnosis.

Some participants reported using an intuitive 'gut' response to patient assessment.

'I do quite often make an effort to go and get them because I actually, from how they are in the waiting room, I'm already unconsciously looking to see how they are, watching how they are walking, bring them in and see how they interact and all those things. So it is almost like a sixth sense you can tell the ones that are really sick.' (Participant 5, interview)

Its value in patient assessment was also described by Participant 8.

'The intuition I think comes with life experiences and interaction with people. And you know for instance when somebody's pulling the wool and you know when somebody's faking breathlessness so you can see that. Looking at your patients you can see when they're in pain, genuine pain and you can see when they're making a meal out of it. You can tell a lot from facial expression, and you can tell a lot from the way people behave.' (Participant 8, interview)

This appears to be similar to, but subtly different from, the intuitive recognition of patterns described in hypothesis generation and resembles more an instinctive impression of the patient's condition or assessment without identification of distinct cues that is informed by years of nursing experience. Three of the most experienced participants (Participants 3,12,14) described instances where the use of intuition or 'gut feeling' was enabling in the management of more complex diagnostic decision-making. Participant 14 described how the inability to actually see the patient impaired her diagnostic decision-making.

'Because well, they all had lots of comorbidities, but he had an awful lot and the fact that he had those two conditions simultaneously and you see I think I would know if I could, I would instinctively know when I can see them.' (Participant 14, vignette 3)

This concept was shared by Participant 3 when trying to make a judgement on the severity of the patient's condition in vignette 3.

> *'It's so difficult when you haven't got the real patient in front of you because to me it would be how much distress he's in.' (Participant 3, vignette 3)*

Participants 3,12 and 14 were among the most experienced NMPs. They appeared to recognise the additional value that an instinctive or gut reaction can bring to the inherent uncertainty experienced when making decisions in complex scenarios, a concept that appeared to be cautiously recognised in less experienced participants.

4.5.6 Influence of bias

Participants were aware of potential pitfalls in their diagnostic decision-making, in particular the risk of failing to think widely enough about differential diagnoses and were shown to actively review their decision-making processes using metacognition to ensure they remained open minded throughout the cue gathering phase and avoided drawing conclusions too early. Although multiple judgements and hypotheses were made by participants they continued to gather cues throughout the consultation.

This awareness of potential bias is demonstrated by Participant 3 in response to vignette 1.

> *'So I'm immediately thinking, you want me to think out loud, I know we're not supposed to do that because we're supposed to stay open minded but I'm immediately thinking shingles at this moment.*
> *Yes, but I wouldn't say it out loud and I'd keep it inside and I'd keep my mind open because so many times you jump to a conclusion and then it's really not that.' (Participant 3, vignette 1)*

Similarly, Participant 10 identified the risk of failing to think widely enough about potential diagnoses.

> *'So straight away you're starting to think of differentials, so I'm thinking possible shingles at this point but I'm not going to stick with it.' (Participant 10, vignette 1)*

This was a common theme amongst participants demonstrated by Participant 12 below who discussed the importance of 'sense checking' initial impressions.

'I suppose things come up and you think 'oh it looks like that', but then you have to filter that through don't you and sense check it?' (P12)

Despite this awareness of potential bias in their decision-making and the recognition of the risk of not thinking widely, there remained an inconsistency regarding the range of differential diagnoses considered by participants, in particular in respect of serious diagnoses. This awareness of bias therefore suggests that the limitation in the generation of differential diagnoses indicates insufficient underpinning knowledge.

A further source of bias was exposed by Participant 7 in the extract below. She identified how previous experience of diagnoses of metastatic cancer in two patients with similar symptoms to that of the patient in vignette 4 influenced her judgement as to the likelihood of the disease

'OK so she's diabetic, hypertensive, Ca breast, mastectomy in 2006. Oh dear, so I'm thinking is this a met? Partly because I've had two in the last year where I've had somebody come in with, and it does make a difference doesn't it to our decision making? And I'm thinking OK this is going to be a chest x-ray.' (Participant 7, vignette 4)

Nevertheless her awarenes of this bias was protective in managing the integrity of her decision-making and ultimately she decided to defer the decision to xray the patient until she was reviewed post treatment.

4.5.7 Managing diagnostic uncertainty

Participants undertook several strategies to manage diagnostic uncertainty. These included reviewing the patient, safety netting (advising the patient of signs and symptoms that necessitate seeking medical advice) and initiating investigations. These were to ensure that the patient was responding to treatment appropriately or had not developed new symptoms which could potentially be a warning that an alternative diagnosis was possible. The most commonly undertaken of these was to arrange follow-up for the patient either through telephone, face to face review or safety-netting.

'I would probably do a phone call the next day and see how he's coping to see if he's developed a fever, 'cos obviously in the back of my mind, and you're always thinking is there potential infection.' (Participant 1, vignette 2)

'You'd probably want to review her and make sure she was improving. Sort of safety net it I suppose, wouldn't you? She was with her daughter, wasn't she? Yes. You'd probably given her history just make sure that she didn't have ongoing cough because it sounds like a respiratory tract infection, but I guess there might have been cough. I mean somebody like her who smokes you'd want to do some spirometry when they were well I think.' (Participant 12, vignette 4)

Some participants used investigations to support their decision-making and manage diagnostic uncertainty. Despite the fact that the majority of participants made a definitive diagnosis there was awareness amongst some of the possibility of misdiagnosis which prompted some participants to instigate diagnostic tests to manage this uncertainty. A clear example of this was shown in vignette 2 where some participants arranged blood tests (Participants 1,6,8,11,14) to manage their concern regarding the possibility of an infective cause.

> *'So, I would be sending him for blood tests and I'd tell him that I'd get the results within three working days, it's very likely I'd get them the next day. Then I would be in touch and that I was looking at making sure that he didn't have any infection in his foot and the blood test would be able to tell me that. I'd also do his CRP probably as well as a full blood count.' (Participant 14, vignette 2)*

Vignette 4 presented unique diagnostic challenges for participants. All participants diagnosed the patient as having an infection of the lower respiratory tract, but most did not seek a more specific diagnosis. Participant 6 diagnosed the patient as having a lower respiratory tract infection (LRTI) whilst eight participants using the diagnostic label 'chest infection'. Chest infection is a non-specific term and encompasses the diagnoses of acute bronchitis and pneumonia (National Institute of Health and Care Excellence, 2020). The use of the diagnostic label LRTI or 'chest infection' is reflective of the ambiguity in diagnostic criteria that differentiates the two diagnoses.

Several participants did however use a range of investigations to explore the possibility of underlying lung pathology: blood tests (Participants 2,8,11) chest x-ray (Participants 2,3,8) and spirometry (Participants 8,9,11,12)

> *'Oh, I would definitely do a chest x-ray, back to the Ca breast, definitely a chest x-ray.' (Participant 3, vignette 4)*

> *'I'm going to send her for some spirometry and a chest x ray and do some bloods.' (Participant 8, vignette 4)*

Table 17 shows four instances where a diagnosis was not made, and more than one differential was considered. In three instances this diagnostic uncertainty resulted in a referral to the GP; however Participant 14 considered the possibility of co-existing diagnoses and managed this by instigating investigations and deferred making a definitive diagnosis until she had received the results of these.

'It doesn't look like he's got any infection but because he's got the COPD I would do a full blood count I think. I mean there's obviously the possibility you could have a lung cancer causing the increased shortness of breath as well as increased heart failure causing the oedema in his legs to rise. So, I'd send him for a chest x-ray I think. Again, I'd have to look to see when he'd last had one done. Yes, so full blood count, Us and Es, LFTs, CRP, BNP. Well, I'd want to know what the last BNP was ..So, he needs investigations so I would bring him back very quickly the next day.' (Participant 14, vignette 3)

This approach was somewhat unusual amongst participants and demonstrates the ability of Participant 14 to manage a degree of uncertainty.

4.5.8 Summary of diagnostic decision-making processes

Diagnostic decision-making was underpinned by pattern recognition, an intuitive process which informed initial hypothesis generation. Participants undertook an analytical process of differential diagnosis in three of the vignettes; however, the range of hypotheses generated was inconsistent amongst participants indicating a variation in the knowledge and experience of individual participants. This represents an area of risk where differential diagnoses, including those indicative of serious disease, may not be appropriately considered.

Some participants referred to the concept of intuition or gut feeling which was rooted in nursing experience. Caution was expressed by some participants in drawing on nursing experience to inform their diagnostic decision-making, but some experienced participants recognised its value in the form of intuition to manage some complex diagnostic scenarios. Participants were aware of the potential for bias in their decision-making and reflected on their decision-making and employed metacognition in order to protect against this.

In addition, analysis of the structure of consultations indicated that participants took a problem focused approach to the vignettes and did not routinely explore complex factors such as medication adherence or co-morbidities or routinely review existing medications. Where these were identified, it was mostly in response to cues within the consultation which acted as prompts to participants.

4.6 Prescribing decision-making processes

This section will explore the theme of prescribing decision-making processes. Two main sub-themes were identified which were analytical and intuitive decision-making.

4.6.1 Analytical decision-making

The majority of prescribing decisions although largely analytical, comprised both analytical and intuitive processes. There was however evidence of a few participants making solely intuitive prescribing decisions in vignette 1 (section 4.6.2), but this was not typical.

Participants were seen to weigh up the need for treatment and then most relied on recall to identify the appropriate drug. Whilst recall can be considered an intuitive process it was utilised in the context of an analytical process in which decisions were made regarding the appropriate dose, and drug interactions. This process is exemplified in vignette 4. In the extracts below participants determined the need for antibiotics by analysing key information from the patient history and examination.

> *'She doesn't feel very well, and she has got a high temperature. I would probably treat her with some antibiotics.' (Participant 2, vignette 4)*

> *'Chest: equal expansion and resonant, wheeze throughout with coarse crackles to both bases, clears with coughing, so that's good, but she's exhausted and she's not very well so I'm thinking that she's going to need some antibiotics.' (Participant 4, vignette 4)*

Although participants were quick to then recall appropriate antibiotics, they immediately had to check their decision-making to consider allergies and drug interactions and adapted their choice.

> *'I would treat her with some antibiotics, so, depending on what they clash with, if she's not allergic, oh she's allergic to Penicillin so I would probably go for Doxycycline.' (Participant 6, vignette 4)*

> '*I'd probably go for, because she's Penicillin sensitive, I'd probably go for Doxycycline if she's been alright with that in the past. But checking her INR again because with any of them we'd have to, is she on a statin?*' *(Participant 7, vignette 4)*

Similar analytical processes were demonstrated in vignette 2 exemplified in the examples below.

> *'I would start him on some…. Hang on…. Let's look at what he's done already. I'd have to check his INR. How much warfarin is he on? Do you know what his last INR is? 6 months ago 46, 2.1 (*reads from card*). Right. So I'd repeat his bloods but I'd put him on some colchicine.' (Participant 8, vignette 2)*

> *'Colchicine. I would have to um just double track any interactions with warfarin.' (Participant 1, vignette 2)*

Participants were seen to recall the drug they were planning to prescribe but then withholding their decisions until they had considered potential drug interactions.

Analytical processes were also used by participants to determine whether they felt competent to prescribe for a patient and participants were seen to weigh up the complexity of the prescribing scenario and determine if they would continue to undertake the decision-making independently

> *'I mean sometimes you are at a loss as to what to prescribe because actually everything looks like it interacts with something and there's no easy answers there and with people with heart failure it's quite a difficult process if their kidney function is a bit knocked off. You are trying to improve the heart failure but then you might knock off the kidneys and those things do get very complex in which case you should seek some help from the GP or a specialist team.' (Participant 2, vignette 3)*

4.6.1.1 Limitations of analytical decision-making

Analytical processes were informed by both participant knowledge and supporting resources. Participants used several resources to support their decision-making including the drug formulary (BNF) and evidence-based guidelines however, they did not always refer to these and were often seen to rely on pre-existing knowledge and experience the quality of which impacted on the appropriateness of the prescribing decision (Table 22).

Table 22 Resources used to support prescribing decision-making

	No resources (Knowledge and experience)	**BNF**	**Evidence-based guidelines**
Vignette 1	4 (P3,6,7,8)	7 (P2,5,10,11,12,13,14)	3 (P4,5,9,10)
Vignette 2	5 (P4,6,11,12,14)	3 (P1,2,3)	4 (P3,8,7,13)
Vignette 3	2 (P3,14)	0	0
Vignette 4	6 (P3,6,8,11,12,13)	2 (P1,10)	5 (P2,4,7,9,14)

Yellow highlighting indicates suboptimal prescribing decision

The computer's electronic prescribing system provided some level of safety netting where resources were not used and was generally relied on to flag up drug interactions.

> *'Most of the time it's in my head, but if it's not I've either got this (*refers to a collection of printed resources) *or I'll say to the patient, this is a real cheaty one, 'well this will tell you all about it' and I check on EMIS mentor and 'I've got a NICE leaflet here for you' whilst I'm running down it myself thinking have I missed anything.' (Participant 3)*

Table 22 summarises the use of resources across the vignettes and indicates in yellow where suboptimal decisions were made. Reliance on knowledge and experience was associated with more instances of suboptimal prescribing than when resources were used. The process of electronic prescribing provided some protection where recall was used as drug doses or the length of a course of treatment may be prompted. However, the system will not indicate the appropriateness of a drug for a particular condition but warned participants of potential drug interactions. The majority of participants relied on the computer to alert them to potential drug interactions.

> *'So I'd give him his prescription for that but bearing in mind what else he's on I would pray to the gods that the computer will flag up to me if there were any interactions.' (Participant 10, vignette 1)*

This was generally reliable, but one example highlighted the potential risk of reliance on this strategy. In vignette 2, participant 4 advised the patient to buy ibuprofen from a pharmacy thus by-passing the electronic prescribing system. Consequently, she was not alerted to the potential risky interaction with warfarin which would have been prompted had she prescribed this via the computer.

It is notable that more suboptimal decisions were made where resources were not used. However, the majority of participants who did not refer to guidelines or resources made optimal decisions indicating that this knowledge is firmly embedded in their decision-making. The appropriateness of a prescribing decision was therefore dependent on the quality and nature of an individual's knowledge and experience where no resources were used.

4.6.1.1.1 Recognising the limits of knowledge

Although most participants were appropriately cautious in making prescribing decisions where they did not feel they had sufficient knowledge, there were a few examples where participants did not recognise the limits of their knowledge and consequently sub-optimal prescribing decisions were made. Additionally, four participants (Participants 3,7,8,14) completed the vignettes without referring to the GP for support, but they did not always make optimal prescribing decisions (Table 18).

Vignette 2 presented a scenario in which the prescribing regime required modification in recognition of the patient's age, associated pharmacokinetics, and cognition. This was recognised by some but not all participants. BNF recommendations for Colchicine advise caution in the elderly and a reduction in the dose with reduced renal function (National Institute of Health and Care Excellence, 2021a). Five of the seven participants who elected to treat the patient with colchicine prescribed a reduced dose (Participants 3,6,8,12,13). The other two participants (Participants 1,2) left the instructions vague .

> *'OK, so I would give him 500 micrograms 2 to 4 times a day until symptoms relieved, but a maximum of 6mgs so that's all I would give him 6mgs.' (Participant 2, vignette 2)*

Both participants referred to the BNF and read the dosage directly from this but did not consider the patient's renal function and associated dose reduction. This lack of interrogation suggests insufficient knowledge of and inexperience in prescribing this drug. In addition, Colchicine is known to have a narrow therapeutic window and patients should be warned to stop the drug in the event of toxic side effects such as vomiting or diarrhoea (Electronic Medicines Compendium, 2019). This side effect is potentially dangerous in the elderly but was only referred to by Participant 6. Similarly, Participant 6 was the only participant to consider the patient's co-existing diagnosis of mild dementia in her prescribing instructions.

> *'He's got mild dementia so you may have to be quite clear what you are doing. If he didn't have the dementia I'd probably say what I've just said, but if I think he's not going to understand I'd probably just say take it three times a day for four days.' (Participant 6, vignette 2)*

Four participants (Participants 3,7,8,14) completed all the vignettes without seeking support from the GP. These were amongst the most experienced prescribers, all having over 10 years' experience of prescribing and with the exception of Participant 8, over 10 years' experience in the ANP role. However, the ability to independently complete the vignettes did not necessarily equate to optimal prescribing outcomes (Table 18).

4.6.2 Intuitive decision-making

The use of intuitive processes was shown to be widely utilised to inform aspects of prescribing decision-making such as recalling appropriate treatment but were rarely used as the sole decision-making process to complete a prescribing decision. However, although the use of intuitive processes enabled participants to be efficient in the prescribing decision-making, there were some instances where their use was associated with inaccuracy and could be attributed to some episodes of suboptimal prescribing.

Recall was used as the sole decision-making process to complete a prescribing decision by three participants (Participants 3,6,8) in response to vignette 1. They were seen to undertake a rapid process of decision-making to determine the dose and duration of the drug in vignette 1. This appeared to represent intuitive decision-making in which participants rapidly recalled the appropriate treatment for the condition and was unique to this vignette and representative of the familiarity of the presentation to these participants.

> *'So, yes, I'd be thinking shingles. Then I'd be thinking, you are wanting about prescribing thoughts, don't you? I'd be thinking about Acyclovir 800mgs, five times a day for five days.' (Participant 3, Vignette 1)*

However, reliance on this process resulted in two participants suggesting a suboptimal duration of treatment (5 days, rather than 7) although the electronic prescribing system mitigates this risk as entry of the drug into the computer system is likely to have prompted participants to reconsider the duration and provides a safety net in such circumstances.

Recall was also used in the process of analytical decision-making as described previously. For example, for the majority of participants the recall of the drug was part of an analytical process.

> *'I would normally prescribe acyclovir as per BNF. Off the top of my head, I would say 800 mg, but I would have to get my BNF.' (Participant 10, vignette 1)*

Rather than relying on initial recall the use of analytical processes (checking the drug in the BNF) served as a safety net enabling participants to use resources to check their initial decision was correct. Where resources were not used the analytical process was driven by the individual participant's knowledge and experience.

> *'So I am always tended to treat them with Colchicine. So, I think it's 500 and then you give it. In an elderly person I'd probably say twice a day for, it's 12 doses then you have a break for three days. So if it's twice a day it's for six days. If he's in a lot of pain he might need it three times a day, so if it's three times a day it's four days and if it's four times a day it's three days. So you've got that option with them. So you would discuss it with him and say maybe you should take it three times a day for the first couple of days and then you can drop, but once you've reached 12 tablets you have to stop.' (Participant 6, vignette 2)*

Analytical processes were also initiated from computer prompts.

> *'Amoxicillin* (computer warning: allergy), *laughs, I'd put her on clarithromycin then* (computer warning: interaction), *well I'm checking her bloods and I'll recheck her again, so I'll still go with clarithromycin.' (Participant 8, vignette 4)*

Overall, this section demonstrates that although intuitive processes in the form of recall were utilised in prescribing decision-making and contributed to the underpinning analytical processes, there is risk associated with their use where it is unchecked, however the electronic prescribing system serves to prompt analytical processes in these instances.

4.6.3 Decision-making processes used to manage uncertainty in prescribing

4.6.3.1 Drawing on knowledge and experience

The ability to draw on knowledge and experience had particular importance in managing uncertainty associated with complex prescribing scenarios where guidelines could not always be applied. The majority of participants used analytical processes informed by knowledge and experience to manage complex prescribing decisions.

This is exemplified in vignette 4 which presented unique difficulties to participants in terms of determining evidence-based treatment choices. This was not only due to the lack of precision in the diagnosis by the majority of participants, where most labelled the patient as having a 'chest infection', but also due to the additional interpretation required in applying antibiotic guidelines to complex situations. For example, guidelines for acute bronchitis suggest a seven day delayed treatment strategy with caveats regarding age and co-morbidities whilst guidelines for community acquired pneumonia (CAP) give the choice of three antibiotics with combination therapy

recommended depending on the assessment of severity (North Hampshire Clinical Commissioning Group, 2018; National Institute of Health and Care Excellence, 2020). Overall participants' choice of antibiotic reflected guideline recommendations for acute bronchitis, CAP and COPD exacerbation (Table 18) and whilst the majority of participants chose doxycycline, the rationale for this, where given, was varied. Two participants (Participants 1 and 7) used the patient's previous experience of the drug to inform their decision-making.

> *'She's allergic to penicillin so I would probably give her doxycycline so I would have a quick look in the notes to see if she's had doxycycline before and just check she'd be ok with that.' (Participant 1, vignette 4)*

On the other hand, Participant 2 made her choice based on local prescribing culture.

> *'I probably would treat with a course of antibiotics obviously not anything with Penicillin in. Doxycycline is very popular out here.' (Participant 2)*

The ability to draw on knowledge and experience was also required in the management of drug interactions which were a major influencing factor in the choice of drug for this vignette. Drug interactions added an additional layer of complexity for participants and for some this resulted in referring to the GP for advice. The interaction with warfarin caused difficulties for two of the participants and resulted in them seeking advice from the GP (Participants 1,2). Participant 6 encountered a similar dilemma when responding to computer warnings of interactions of both doxycycline and clarithromycin with warfarin in vignette 4. She attempted to use the BNF to guide her decision but found this unhelpful and eventually made a decision based on the least complicated regime for the patient.

> *'Increased risk of bleeding events, increased anticoagulant. What's the difference in those two? One says increased risk of bleeding, one says increased anticoagulation. Isn't that the same thing? One advises to monitor INR, one advises monitor INR and adjust dose. So I don't know whether I've got enough knowledge to know and I don't know whether the BNF is really telling me any more than I need to know the difference between the INR of the Doxy and the Clarithromycin. I'd say they are probably about similar. You give either or and I know you are going to say to me you need to choose one. So I would probably go for the Doxycycline just because you can give it once a day.' (Participant 6, vignette 4)*

Interestingly the remaining nine participants who made a prescribing decision for this patient were confident managing the interaction of antibiotics with warfarin and when alerted to the

interaction did not consider this a sufficient risk to look for an alternative drug. They simply adjusted their plan to include a follow up blood test to check warfarin levels.

> *'Okay so that's no problem I would ask when she's next due for her INR check and if its within 3 days then she can keep that appointment. If it's not, then I'll make another appointment to come back and check her INR.' (Participant 9, vignette 4)*

4.6.3.2 Intuition to manage uncertainty

Two participants referred to an instinctive response to support their prescribing decision-making in vignette 4. Participant 12 described how she would use 'gut instinct' to inform her prescribing decision-making. She described how an impression from visualising the patient in vignette 4 would enable her to assess the severity of their condition and inform her antibiotic prescribing.

> *'It tends to be a bit of a gut instinct thing when you are seeing them doesn't it, I think if I thought she was a really at risk of hospital admission I'd probably go with Clarithromycin.' (Participant 12, vignette 4)*

A similar approach was taken by Participant 14.

> *'Again it would be what I thought, whether I thought she was, if I thought she was really, if I was concerned, I would give it to her for seven days or I'd say to her look I'm giving it to you for five days but if you feel that you are getting better but you need a bit more just have a phone call with me and I'm very happy to issue two more days.' (Participant 14, vignette 4)*

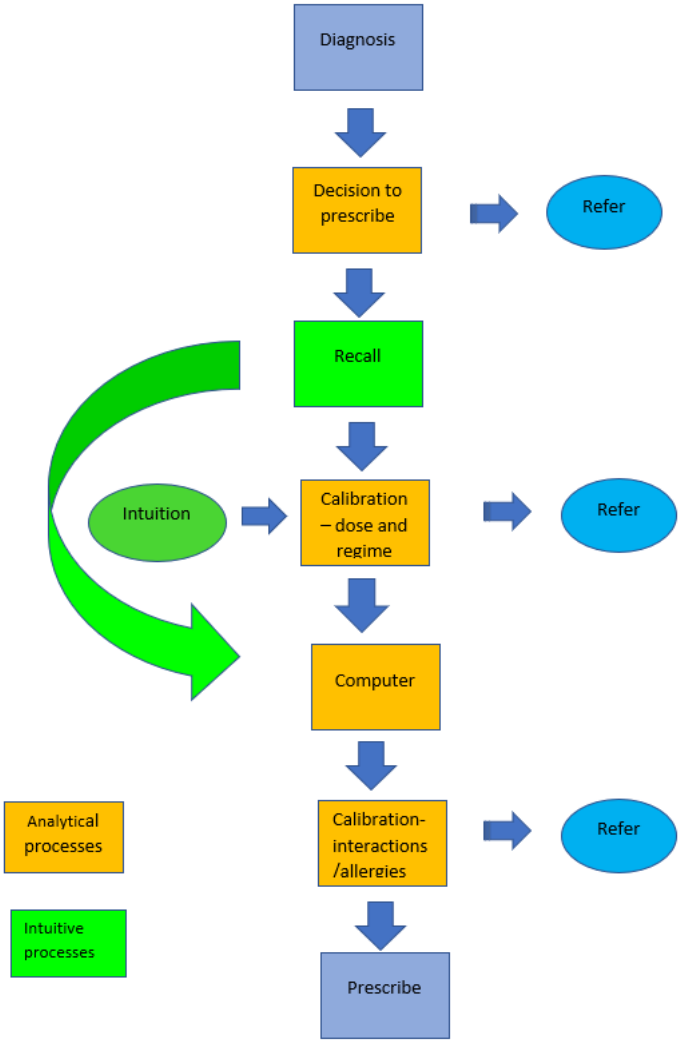
This approach was considered to represent intuition and was characterised by the participant making an overall assessment based on an instinctive, intuitive response based on previous knowledge and experience and therefore the appropriateness of its use is dependent on the quality of this underpinning knowledge and experience.

Vignette 4 represented a scenario in which the complex presentation of the patient represented uncertainty for the participants in determining treatment choice and the management of drug interactions. Management of the scenario was dependent on their ability of participants to draw on their knowledge and experience in a situation where guidelines and formularies would not provide a definitive answer to the clinical presentation.

4.6.4 Summary of prescribing decision-making processes

A diagram summarising the prescribing decision-making processes undertaken by participants is represented in Figure 16 below.

Figure 16 Summary of prescribing decision-making processes



Analytical processes are shown in amber whilst intuitive processes in green. The diagram shows the predominantly analytical approach to prescribing decision-making. The green arrows show the interplay of intuitive decision-making that was utilised by a few participants, but even then, the computer prompted an analytical component to the process. The calibration boxes represent the analytical processes in which participants utilised resources or drew on knowledge or past

experience to inform their decision-making. In some instances this resulted in a referral to the GP for further support.

4.6.5 Managing risk in prescribing decision-making

Generally, participants were shown to be cautious and unwilling to take responsibility for prescribing in situations for which they did not consider themselves competent to prescribe which was evident in the high referral rate in vignette 3. Similarly, caution was exhibited in prescribing some drugs whose side effects were considered to represent risk. However, there was evidence amongst the participants of different thresholds of risk which could be linked to individual knowledge and experience.

4.6.5.1 Perception of risk

Participants' responses to vignette 2 revealed different interpretations of risk which was demonstrated in the interpretation of guideline recommendations for the treatment of gout. Guidelines for gout recommend either oral colchicine or a non-steroidal anti-inflammatory drug (NSAID) first line where there are no contraindications (National Institiute of Health and Care Excellence, 2018a). Six of the eight participants opted to treat the patient with colchicine. However, this was considered too risky by Participant 14 and an alternative was sought.

> *'I think in an 86-year-old I wouldn't be looking at something like colchicine because it's a very high toxic drug and I definitely wouldn't prescribe that without talking to a GP.' (Participant 14, vignette 2)*

The potential for toxicity was only referred to by one other participant (Participant 6) who described the advice she would give to warn the patient of signs of toxicity. This demonstrates a difference in the tolerance of risk between these two participants who were both knowledgeable about the drug and identified the same potential risk to the patient but differed in their choice of treatment based on their perception of risk.

A further example of differences in perceived risk was demonstrated by Participant 7 in her decision to treat the patient in vignette 2 with ibuprofen in preference to colchicine based on experience of a research study in which she was involved where ibuprofen proved more effective than colchicine. However, despite ibuprofen being a treatment option in the guidelines it presents

a significant risk of bleeding for an elderly patient on warfarin represented by the patient in vignette 2 (National Institute of Health and Care Excellence, 2021a) and therefore could be considered a high risk option. This risk was recognised to some extent by Participant 7, but she continued with her prescribing plan and took measures to mitigate this.

> *'So I'd probably say to do that, to use ibuprofen, but making sure the dose of omeprazole… Probably double up on his omeprazole just to be sure. But with the warfarin to measure his INR. Can't find which card it's on. So yes, just to protect for his gastric bleeding but to protect him from that, but to use Ibuprofen if he's normally OK with it, but recheck his INR* [blood test to check international normalised ratio].'

The level of risk in prescribing ibuprofen was considered unacceptably high by other participants.

> *'He's been taking regular paracetamol and occasional ibuprofen* (NSAID), *so we'd need to discuss ibuprofen and the dangers with warfarin, and we'd have to explain that to him so he doesn't take it in future.' (Participant 1, vignette 2)*

> *'And he clearly needs analgesia but because he's on warfarin anyway I wouldn't give oral NSAIDs to an 86-year-old even if he wasn't on warfarin, not out of choice. I'd explain that to him that those types of medications usually work well if it was gout he had, but that I couldn't give it to him.' (Participant 14, vignette 2)*

Participant 7 was unusual in her acceptance of the level of risk posed by ibuprofen to this patient and represents a further example of the range of risk tolerance amongst the participants.

4.6.5.2 Shared decision-making

Shared decision-making is of fundamental importance in ensuring patients are able to make informed choices about treatment by sharing with them the associated risks and benefits (National Institute of Health and Care Excellence, 2021b). Whilst the majority of participants used a system of safety-netting to inform the patient of signs of worsening or concerning symptoms and when to seek help only one participant used shared decision-making to inform her treatment choices. This was exemplified in vignette 4 where Participant 13 was shown to weigh up the risks and benefits of treating the patient with antibiotics and finally decides to share the decision-making with the patient to manage the uncertainty of this scenario.

> *'So much of me doesn't want to prescribe and so much of me wants to keep you safe. So I need to talk to her about this as well, because actually she may have really strong feelings*

either way which may actually be the thing that swings your prescribing, because she may say 'I really don't want antibiotics.' (Participant 13, vignette 4)

Participant 13 was unusual in adopting this strategy to manage risk and uncertainty and this was only demonstrated in vignette 4. More commonly participants used a system of safety-netting or follow up to manage the risk of deterioration.

'I would ask whether the daughter could be with her whilst she's feeling so unwell or if not to contact her regularly. I can ask the warden to keep an eye on her. So if she developed any, got worse, if she wasn't, it depends what day of the week it was so I could obviously see her again but if it was Friday I would say the antibiotics will take about 48 hours to work then you should be feeling better, if you are no better but no worse call 111 for advice if you are not improving, but if you are deteriorating then you need to go to A&E.' (Participant 14, vignette 4)

4.6.6 Additional factors impacting prescribing decision-making

The vignettes contained additional factors which added complexity to prescribing decision-making which were identified by some but not all participants (Table 15). Failure to identify these had potential safety implications for patients.

4.6.6.1 Prescribing for comorbidities

Attention to factors which signalled poor control of comorbidities has been identified as inconsistent amongst participants and across vignettes (section 4.3.2.5) and participants were shown to prioritise the presenting complaint. Where steps were taken by participants to manage comorbidities, the priority attributed to this varied between vignettes and reflected the perceived risk to the patient.

Where poor control of co-morbidities was identified by participants as requiring action in vignette 4 (Participants 1,3,6,7,8,14) this was managed by arranging appropriate tests and follow-up and was not considered a prescribing priority for that consultation.

'OK, you could just say your blood pressure is a little bit high today when you are feeling a bit better in two weeks' time just pop to the chemist next door and just get that checked again.' (Participant 6, vignette 4)

'So, I would get her reviewed by the diabetic nurse at this point to re-check her Hba1c to talk again. In a ten-minute consult I'm more focused on her chest um treating her for today, but certainly she's going to need to come back and see the diabetic nurse and I would

arrange that within the next week to, um, would I redo her HbA1c, is there much benefit to that? Probably not, we know its high, um 3 months, maybe yes.' (Participant 1, vignette 4)

This contrasts to the approach taken by participants in managing the patient's blood pressure in vignette 1 where all but one of the five participants (Participants 2,6,10,13,14) who identified the patient's blood pressure as being raised took measures to manage this on the same day, judging this as more urgent. This was likely due to the association with other risks identified for this patient, in particular non-adherence to medication.

4.6.6.2 Impact of non-adherence on prescribing decision-making

Non-adherence to medication was not routinely identified by participants. Only six participants (Participants 2,6,10,12,13,14) explored this aspect in vignette 1. Where this was identified it represented additional risk to prescribing for some participants.

For four of the participants (Participants 2,6,10,13) the combination of the patient's blood pressure and non-adherence to medication in vignette 1 made this a prescribing priority for the current consultation.

'I don't mind some blood pressure meds, but I probably would speak to the doctor and say is it worth just starting him on Ramipril or something to see if we can bring his blood pressure down a bit.' (Participant 2, vignette 1)

'But his blood pressure, is it 180/90? I don't know if I even really want him to walk out the surgery actually at this point.' (Participant 13, vignette 1)

The increased risk represented by non-adherence to medications resulted in them seeking support from other members of the team to complete the scenario.

'If I was still unsure of actually what he had taken and then the effects of him suddenly going and taking everything all in one go having not taken anything potentially for months. So at that point what usually happens then is I'd go in and have a discussion with the GP.' (Participant 13, vignette 1)

For the other two participants (Participants 12,14) who recognised non-adherence as an issue, follow up was arranged but not urgently and without referral to the GP.

'Gosh (looking at blood results) *so he's completely let his diabetes go, so this is going to be quite a long consultation and he definitely needs to come back, and one would start to try*

addressing, explain how important it was to take his medication and want to know why he'd stopped and bring him back soon.' (Participant 14, vignette 1)

All participants who identified non-adherence in vignette 1 recognised the risk to the patient, but the willingness to take responsibility for this risk varied amongst participants. This is reflected in the quote below from participant 6 who voices her concern regarding accountability for the case should problems arise and contrasts to participants 12 and 14 who were willing to take responsibility for the consultation.

'He could have been running around with a BM of 18 and a high blood pressure for months. But then obviously you are then at risk if there's anything that happens to him between now and the time that he's seen, it kind of lands on your door. So, to cover yourself you'd be better off getting his medication reviewed quickly at the end of clinic today.' (Participant 6, vignette 1)

In vignette 3 only three participants (Participants 2,7,13) identified non-adherence to medications as a contributory factor to the patient's symptoms which had particular significance for making a diagnosis and management of the scenario. For participant 2 this was a familiar scenario.

'That would be my first thought get his diuretics back on thingy, taking them properly, and then I review them, I don't know if all GPs bring people back, but I would probably follow him up. Get some bloods done, follow him up…
I would ask him to go back up to that two. I would probably run this by the doctor as well. I'd probably ask him if we could bung one on at lunchtime as well, bit short term. I might think if I felt like he needed some clinical monitoring I might ask Rapid if they could just keep an eye on him. Get some bloods done. That's what I'd do for him.' (Participant 2, vignette 3)

Even so, the complexity of the prescribing decision-making resulted in her seeking additional support from the GP. Similarly, participant 13 also sought support recognising this to be outside of her scope of competence.

'So one of my goals if that's the word for the year, is starting to looking more at this type of presentation because we have a very high older age population but currently cardiac drugs even though the Bumetanide is already prescribed and that could be something that's actually quite significant in terms of helping him over this I need to speak to one of the GPs about his medicines.' (Participant 13, vignette 3)

Participant 7 was the only participant out of the five who completed this vignette independently, to recognise non-adherence as a contributory factor to the patient's symptoms. Non-adherence to medication adds significant risk to prescribing decision-making and a level of complexity that is challenging to prescribers. Failure to identify this represents significant risk to the patient.

4.6.7 Summary of prescribing decision-making

The majority of participants completed the prescribing element of the vignettes independently with the exception of vignette 3 which represented a complex scenario for which the majority did not feel competent to prescribe (Table 20). Most prescribing decisions were considered optimal in the context of evidence-based guidelines (Table 18). On the whole, participants took an analytical approach to prescribing decision-making but with some recourse to intuitive decision-making. There were a few examples where participants used a solely intuitive approach and relied on recall to inform their prescribing decision-making in vignette 1 which reflected the familiarity of the scenario to participants, but mostly they undertook an analytical process supported by a mixture of knowledge, experience and evidence-based resources. The computer prescribing system was relied on to prompt issues regarding drug interactions and allergies. Where participants considered themselves to have insufficient knowledge to manage a prescribing decision, they sought support or referred the patient to the GP.

There were a few instances of suboptimal prescribing in response to the vignettes. Suboptimal prescribing was associated with intuitive decision-making where it was used as the sole approach to decision-making. In addition, the knowledge and experience of prescribers and particular prescriber characteristics such as an individual's perception of risk contributed to some instances of sub-optimal prescribing.

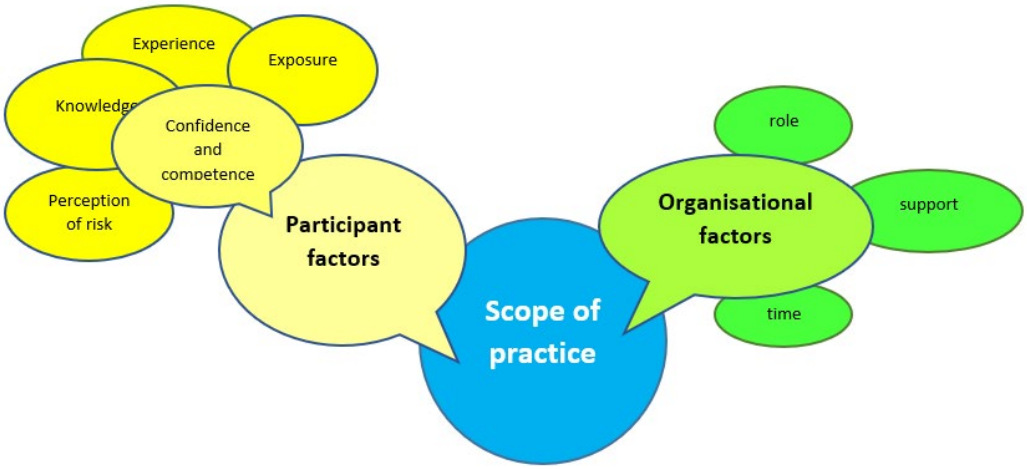
Participants managed uncertainty within the vignettes by drawing on their knowledge and previous prescribing experience which consequently resulted in an inconsistency amongst participants in their ability to independently complete vignettes.

Participants prioritised their prescribing to the context of the presenting complaint and additional complex factors were inconsistently identified and acted upon by participants. Where these were identified the ability to independently manage this varied amongst participants but often resulted in an unacceptable level of risk and referral to the GP.

4.7 Explaining decision-making: contributing and influencing factors

This section will focus on the analysis of the participant interviews to identify how participants explained and rationalised their diagnostic and prescribing decision-making. 'Scope of practice' was identified as a major sub-theme and was central to participants' decision-making. Its influence was multifactorial and could be further divided into sub-themes of participant and organisational factors. Within these further sub-themes were identified which are represented in Figure 17 below.

Figure 17 Explaining decision-making



4.7.1 Scope of practice

Participants' scope of practice was a major influence on decision-making processes. Each participant's scope of practice was informed by a number of factors which were either intrinsic i.e. characteristic of the participant or extrinsic i.e. emanating from the organisation. This section will explore the influence of these factors on participants' decision-making processes.

4.7.1.1 Participant factors

4.7.1.1.1 Confidence and competence

Having the confidence and competence to complete an episode of care was a frequently cited concern of participants and recognised as a challenge when managing complex scenarios.

> *'It is a big responsibility and that's why you need to work within your level of confidence and competence really and accept when you need to go and ask for help' (Participant 1, interview.)*

> *'I'm aware of my line in the sand and I'm not going to try and be a smarty pants and guess. If I don't know I'll ask.' (Participant 2, interview)*

This was evident throughout the vignettes where participants were seen to assess their confidence and competence to manage the patient and refer where they assessed this as falling outside of their scope of practice.

> *'I tend to* (refers to managing the case independently) *particularly with respiratory things because I've diagnosed a lot of heart failure in patients with COPD who other clinicians haven't seen and things, so it's something I'm fairly confident about. But as I say if I doubt it and I thought that it was beyond my capability obviously I would ask his GP, or if his GP wasn't there then the duty doctor to come in.' (Participant 14, interview)*

Several factors were identified by participants as determining the individual participant's confidence and competence and will be discussed in the sections below.

4.7.1.1.1.1 Clinical experience

There was considerable variation amongst the participants with regard to which vignettes and to what extent they were prepared to independently manage them. This extended beyond the cumulative level of experience in the role with some very experienced prescribers completing some but not all scenarios, and similarly some relatively inexperienced prescribers successfully completing some vignettes independently. This was explained not by the length of experience, but the type of experience they had had in previous roles and specialties, and how this related to the presenting conditions within the vignettes. Participants identified the importance of drawing on clinical experience in previous roles in their ability to manage the vignettes. This was important in determining the clinical conditions that they felt confident to tackle.

> *'I'm very comfortable with trauma and cardiovascular and chests I like. I prefer those to, which you get a lot of actually, it's because I've done cardiology I can draw upon that experience and obviously I have to update what I'm doing but the understanding is there from that experience.' (Participant 8, interview*)

> *'Yes, I'm not comfortable managing heart failure because of, I've never worked on a medical ward and it's usually adjustments in medications and with heart failure goes renal failure and then the blood pressure. Yes, I'm not comfortable at all with heart failure. I*

don't think I've ever been to a nurse practitioner where they've said that we should be managing them unless we're heart failure nurse specialists.' (Participant 6, interview)

Similarly, previous experience was enabling with regard to prescribing decision-making and was demonstrated in the range of confidence amongst participants in managing warfarin interactions. Participants who had previously worked as practice nurses had often had experience in managing patients' warfarin and drew on their experience to inform this.

'I think because I do INR clinics and stuff like that, I am aware that any medication we prescribe for them will alter that, but it's often not as bad as you think it's going to be.' (Participant 9, interview)

For a minority, who had not had this experience, this was a stumbling block and necessitated discussion with the GP.

Participants cited conditions for which they did not feel they had sufficient experience and consequently would seek advice from or refer to another clinician.

'So, I'm not at the point where I would start changing heart failure med and increasing diuretics. No, I recognise that that's not where I'm confident. There are other ANPs who have got a background in heart failure. I have a colleague who was a heart failure specialist so she would feel quite happy to you know, to stop this and change that, but no, then I think, it's for me, you think OK I'll speak to the team.' (Participant 1, interview)

4.7.1.1.1.1.1 Exposure to clinical scenarios

Participants reported exposure to similar clinical scenarios in their current role as key to having the confidence to manage a presentation and having the confidence to prescribe.

'That's about learnt behaviour and learning, and you think oh I've done this before so I can do this. I used to be quite anxious with patients with exacerbation of asthma and I would often go and talk to the doctors about giving them steroids and things, whereas now I know I don't have to do that every time. As you get more experienced you think right, I can deal with this one, but I still have, I know you could be caught out.' (Participant 5, interview)

*'To begin with I'd get quite anxious as to why is one doctor saying to use Cetraben (*emollient*) and another one says Epiderm, and I would get worried about that and I'm not worried about that now because having lived it and found out they're pretty much the same stuff and one works for one and not the other.' (Participant 4, interview)*

Participants were cautious in managing situations independently to which they did not feel they had had sufficient exposure which is reflected in the comments below from Participant 13.

> *'at the bottom of my mind is that, because I went into primary care when I qualified within 10 months, I've never done acute anything ever since I was a student nurse and therefore I constantly work on the basis that I'm going to miss, my fear was that I would miss something.' (Participant 13, interview)*

This is similarly reflected by Participant 1 in her response when asked what aspect of the scenarios she found most difficult.

> *'Um, well INR definitely, um warfarin doses, it's something I've never had to get involved in directly I know in our practice the practice nurses do INR star and um there's just no need for me at the practice we have a practice nurse who does it, in fact the HCA does the INR and they must have some system because obviously if she gets the result straight away.' (Participant 1)*

The concepts of experience and exposure overlap but this reflect the importance of the dual contribution of prior experience in different clinical fields and frequent exposure to a clinical situation in their current role which participants identified as informing their decisions to prescribe.

4.7.1.1.1.2 Experience and exposure to complex scenarios

The importance of experience and exposure was exemplified in the management of complex patients. Participants generally felt confident to manage familiar presentations such as infections in the context of co-morbidities and polypharmacy but were consistent in their caution regarding patients with some chronic conditions such as heart failure where they felt they had inadequate experience and was reflected in the high number of participants who referred the heart failure patient in vignette 3.

> *'So, with this chest infection type approach or an upper respiratory if it's that type of presentation despite the comorbidities then actually, I will manage those. So infective process I will manage quite independently. Worsening heart failure events tend to go, will always go into a shared care.' (Participant 10, interview)*

> *'So cardiac failure, I don't like heart failure, so I don't like those ones.' (Participant 4, interview)*

Diabetes was another area about which some participants expressed caution.

> *'Literally that is just one* (referring to diabetes)*, I don't think that's even conquerable in my working lifetime. So, I don't touch it with a barge pole because to me, and I understand that's how people have approached COPD, is oh well all I can see is harm, harm, harm, harm that I could do. I don't think it's an area that I can try. So, I either need to commit to learning or I need to just say it's not on the agenda and it is not on the agenda.' (Participant 13, interview)*

However, this was not universal with some participants having had prior experience in managing patients with diabetes.

> *'I can do the insulins and all that sort of stuff because when I was a practice nurse years ago I specialised in diabetes and my background is in cardiac ICU, so I'm happy with all those.' (Participant 3, interview)*

Participants generally expressed caution and to some extent dread at the prospect of assessing patients with co-morbidities and polypharmacy.

> *'Okay. Right at this point I have a little bit of a heart sink because I already know that there's quite a lot. It's going to be very difficult in this consultation.' (Participant 9, vignette 2, interview)*

Some described how they would try to identify complex patients from the clinic list and divert them to the GP before getting too involved in the consultation.

> *'if their booking notes say diabetic anything then I just, obviously if it's skin and diabetes that's fine, but if it's actually about control or meds I don't, I won't call them in and if they're booked in to see me and I can see it in the afternoon I'll try and move them over to the GP.' (Participant 13, interview)*

On the other hand, others discussed their willingness to start the consultation on the understanding that support would be available.

> *'Yikes. It's oh goodness! But OK my first thought as a nurse practitioner is OK complex, let's see what I can do, at least take a history, practice safely, I've got a GP here I can pass over and also that I do have a good relationship with the community heart failure nurse so she's excellent so I know I can call her if the GP is out on visits.' (Participant 7, vignette 3)*

This approach relied not only on an individual participant having confidence in their assessment skills but also in the availability and ease with which they could access support.

4.7.1.1.1.3 Underpinning knowledge

Participants reflected on their prescribing training and recognised its value in providing a foundation for their prescribing. However, they did not feel this prepared them for the reality of prescribing in practice.

> *'I suppose it gives you a good foundation as to how medications work and some of the basic considerations but when you are faced with somebody who is on 10 different medications then if they've got a multi-morbidity then probably, yes, I don't think the training can quite cover that.' (Participant 12, interview)*

Participant 4 described the importance of exposure and mentorship in developing knowledge.

> *'I think mostly what prepares you after you've done all the course work is just doing it and seeing the patients and seeing them either yourself or next to the GP or next to another prescribing practitioner that supports your decisions, and you can just talk through things with them. You can go through as many scenarios as you like but until you've got the patient in front of you and until you are doing the decision.' (Participant 4, interview)*

Whilst the concept of exposure was universal amongst the participants, access to mentorship was varied, with many participants describing self-directed education where they accessed on-line resources, journals, textbooks and conferences to support their learning. Participants also cited numerous resources they would access to support their decision-making.

> *'The resources I use in nearly every consultation I use the BNF online, and the CKS guidelines. Even if I know it I still check it. It takes two minutes, I get them up and I just check. And things just do change all the time and things you've read on there the next week you go in and it's not there. So, yes, so the CKS guidelines and the BNF are literally my bibles. And then for different conditions I use other resources, so for dermatology I use the BAD (British Association of Dermatologists) and Dermnet.' (Participant 6, interview)*

Important here is the concept that most learning took place after completion of the prescribing course and some participants had little access to formal academic teaching. Consequently, the development of their prescribing practice was reliant on their motivation to direct their own learning, supervision from colleagues and exposure to clinical situations.

4.7.1.1.1.4 Perception of risk

The level of risk that participants were prepared to take in prescribing decision-making in the vignettes varied amongst participants, but they were all unwilling to take risk in situations for which they perceived they had insufficient knowledge or experience. Participants elaborated on the perception of risk identified during the analysis of responses to the vignette (section 4.6.5.1) and considered a situation to be risky where the potential for harm to the patient was perceived as unacceptably high or for which they felt they had insufficient knowledge and the consequences of prescribing may have repercussions for them with their professional body (NMC).

> *'it's a huge responsibility, um, and you know if you don't pick up the problem and you prescribe someone antibiotics for a chest infection when its actually not a chest infection, its heart failure you could actually be causing severe harm to that patient.' (Participant 1, interview)*

> *'I would say are you really allergic to Penicillin? Because they always say 'when I was three I had a rash'. And I'd say well, but the fact is once it's there who is going to prescribe it? Some of the doctors here might but they are probably braver than me and I'd be thinking I'm not risking my* (registration), *so she can't have that.' (Participant 2, interview)*

Furthermore, participants perceived consultations in which they had previous knowledge of the patient as representing less risk.

> *'If you know them you are more confident because you've maybe been through a similar situation with them before. Some of our COPD you know they exacerbate; you know which medications help and you know how quickly they respond. So you know what their oxygen level goes down to when they are exacerbating. I suppose if it's something you've seen before with that particular patient, and you know that last time this worked.' (Participant 12, interview)*

Participants had a clear perception of their scope of practice and were not prepared to step outside of this. Whilst safety netting was used by participants to manage the risk associated with the uncertainty regarding the trajectory of the patient's condition, the risk of independently managing a scenario about which they did not feel they had the appropriate knowledge and experience was not acceptable to participants.

> *'If the heart failure scenario had the temperature and the green phlegm and short of breath and a little bit puff but they say they are always puffy then I could potentially manage that, but with very strict safety netting because the chances are people with heart failure do get chest infections and do become short of breath, so if they've got a temperature and green phlegm... But with any shortness of breath and filling up with fluid I would always get the GP, it's practically 100%.' (Participant 6, interview)*

All participants considered the GP to have ultimate responsibility for the patient and referred the patient to them where they perceived they had insufficient knowledge.

> *'But at the end of the day those patients are registered to a doctor they are not registered to me and there is only so much I can do as a nurse.' (Participant 8, interview)*

Some participants were confident to seek specialist advice or admit patients to secondary care without consulting the GP. Even so, where they considered they did not have sufficient knowledge or skills to manage a patient scenario, they referred to the GP.

> *'I'd make a judgement call of what I'm seeing in front of me. The fact that he's walked in and he's settled I don't think there's any need for me to send him because I would only send him for an emergency. If I think he might need to go to the medics, he could very well need to go to the medics, but the GP can decide on that. So, I would put him into one of my more urgent slots which would be in the next hour.' (Participant 6, vignette 3)*

This perception of risk was not only dependent on knowledge and experience of the individual participant but was also linked to their perception of their role and the limits of their responsibility. Some participants expressed a wariness of over-extending their scope of practice.

> *'You know, the whole point of nurse practitioner what I got from is it's that we're there to manage undifferentiated presentations either manage them fully if we can or refer on but what, but what, I don't know if you find that, but there are certain types of nurse practitioner, breed of nurse practitioner who think they are doctors and maybe are working at that level and so be it if that's the case, but I definitely am not and I will, well even sometimes I'll take a history from a patient and before I do anything else I'll put them straight to the doctor because it's beyond I just think well this it's easiest for the doctor, this isn't for me and they need to be referred on.' (Participant 10, interview)*

Two participants expressed a feeling of vulnerability in respect of protection from their regulatory body (NMC) in their ANP role. They considered themselves to be less protected than doctors undertaking an equivalent role, and this too impacted on their assessment of the risk of undertaking a scenario.

> *'And if they say do Doxy I'd just say you prescribe it because I'm not happy to. I have said this to the doctors, I said the GMC will look after you, I said the NMC could burn me at the stake as a witch, well and truly.' (Participant 2, interview)*

'What stops me [prescribing]? My PIN number and wanting to be safe.' (Participant 4, interview)

Overall, all participants identified risk at the point where they felt they did not have the competence to manage a scenario, but the threshold and assessment of that competence differed amongst participants depending on their knowledge, experience and exposure to similar clinical situations.

4.7.1.2 Organisational factors

This next section will consider the organisational factors that influenced participants' scope of practice.

4.7.1.2.1 Role within the practice

Despite all participants undertaking 'urgent' or 'same day' acute assessments in their roles this was not the sole aspect to the role for all participants. Some participants were additionally involved with chronic disease management clinics, home visits or had practice nurse clinics (section 4.2.3).

Some participants reflected on how the nature of the 'acute' clinic impacted on the scope of their consultations and how they determined clear boundaries. They did not consider it their role to manage chronic presentations such as diabetes or hypertension management or undertake medication reviews within these clinics.

'With diabetes, any of the chronic diseases if they've got a good clear history or something acute going on I'm reasonably confident, but if they've come to me because of their medications then that I wouldn't be confident with either because it's not really my role.' (Participant 6, interview)

This reluctance to widen the scope of their consultations was not confined to those who worked solely managing acute presentations but extended to some participants who ran chronic disease management clinics. Whilst these practitioners had the skills to manage the additional complexities of some chronic disease that may present in an acute clinic, they did not consider it their role to address this in this situation. This suggests that the type of clinic participants undertook was as influential as their perceived competence in their willingness to manage additional complexity.

Participants 1 and 3 expressed frustrations at the restrictions imposed on their role, in particular with regard to the inability to follow up patients.

> *'I'd love to review more patients but there just isn't scope in what they need me for to do that because I think sometimes you do just lose the flow when you're doing acute all the time because in some of those scenarios I'd like to say yes I want to check your HbA1c, come back and see me, let's have a look at your meds, lets tweak them.' (Participant 1, interview)*

However, participants who ran chronic disease management clinics had more flexibility and they were able to use these clinics to follow up some aspects of the consultation.

> *'What I would normally do, because my backgrounds respiratory, so once I've treated her for an infection, what I'll do is I'll task myself to send out an appointment' (Participant 11, interview)*

Some participants described how they had prepared a list of conditions that were suitable to be booked into their clinics to facilitate efficiency and avoid patients with conditions they considered beyond their scope of practice being allocated to them.

> *'So we'll have a list of what the practice nurse will do and what the nurse practitioners, as a group, the GPs, the nurse practitioners and the manager we sat together and decided what we would be happy to see. We were not happy to see pure chest pains of palpitations we felt that would be, there's no point them having a 10 minute appointment with us and then us having to say to the GP so and abdominal pains in adults.' (Participant 11, interview)*

However, this was not always adhered to and generally there was a frustration amongst many of the participants about being asked to see patients that were perceived as complex and outside of their scope of practice with some participants swapping patients with the GP before they started their clinics.

> *'I get a lot of inappropriate things which are complicated, so I get a lot of the chronic pain that have been on every painkiller under the sun, and they want something sorted out today. It's an emergency for them and they are in pain, but you know.' (Participant 6, interview)*

4.7.1.2.2 The influence of time

Time was repeatedly cited as a factor affecting participants' decision-making. Participants were mostly allocated 10 or 15 minutes in which to complete their consultations. Complex patients were consistently identified as disrupting the flow of the clinic and required more time and were a consistent source of stress amongst participants.

> *'With the same day clinic you have absolutely no idea what you're going to see and often the things you look down the list and you go that's alright , straight forward, when you actually get to it, oh crumbs that's not and I've got a bigger problem on my hands than I first thought, and there's immediately, the moment you're in a 15 minute appointment and you realise you've got more going on than you thought you know you're going to be running late. And that start to put your, it just makes me a little bit apprehensive, because I think I know I'm going to be running behind and I don't want to run behind, but I need to get this sorted.' (Participant 9, interview)*

Some participants described how time would also influence the depth of their consultation.

> *'Depending on the time, how much longer I've got in the consultation I would ask him what support he's got at home and if that's the case I would arrange that during the next review.' (Participant 9, vignette 1)*

Time restrictions were generally seen as a restrictive factor and a source of stress for participants when managing complex patients where they were frequently allotted insufficient time. Three participants described a team approach to the patient demand (Participants 5,10,12) which combatted this to some extent.

> *'So we're all help each other, very, very, it's probably the best surgery I've worked at for being inclusive and helping each other so if they see one of you struggling like, even in the nurses' clinic, if you get something that goes wrong or a patient over runs or something, one of your colleagues will pick it off your list.' (Participant 10, interview)*

Generally, however, this was unusual and running late was an ongoing pressure for participants.

4.7.1.2.3 Support

Support from GPs was mixed with some participants describing a supportive relationship (Participants 4,5,9,10,11,12,13) whilst others worked more independently and had little contact with the GPs (Participants 1,2,3,6,7,8,14).

Those participants for whom contact with the GPs was infrequent were amongst the most experienced practitioners. They described infrequently referring patients to the GP and they were only called on when necessary.

> *'Very infrequently (consult GP). I'll discuss patients afterwards just to maybe run by, maybe once every few weeks I'll just have a niggle and think I just want to chat through.' (Participant 7, interview)*
>
> *'OK, so if I see 60 patients a week, I maybe get the GP in for one.' (Participant 3, interview)*
>
> *'And also, we work so full on, the GPs are exhausted, we're all exhausted so I only contact them if I really need to because otherwise they wouldn't be very happy really.' (Participant 14, interview)*

These participants appeared to take a role independent of the GP with a heightened sense of autonomy which was different to the approach of those who had more of a team-based approach.

> *'In a GP surgery there's very little time to ask GPs, everybody's got their own list and, you know, off you go.' (Participant 8, interview)*

Nevertheless, they still identified a limit to their autonomy and scope of practice which was closely linked to their perception of their role and professional identity.

> *'Because I think that the advanced nurse practitioner is very much going into the doctor's domain if you like with all these chronic patients. I personally feel that that's not what the role was designed for. We're nurses at the end of the day and more and more things are creeping into our roles and you have to have an awareness of where you are comfortable because things might be moving on, but you've still had your level of training and it's easy to get carried away with extending your role more than you should be.' (Participant 6, interview)*

Other participants worked closely with the GPs and described a supportive relationship where GPs were readily available to support them, and this was often used as a learning opportunity to develop their practice.

> *'We tend to work together and quite often they'd come back in a review with me because I mean that's partly how we learn as well.' (Participant 12, interview)*

> *'But I wouldn't pass them on, what I would do is, because we're so lucky we've got this support, you have to wait, but then I would talk it through, and they usually would bring the notes up or they'll come. Some have different approaches, but either way then they would often trust what I say and say OK well in that case and then we'd have to decide really between us what we were going to give or do.' (Participant 5, interview)*

This was in contrast to the experience of Participant 2 who described the inadequacy of the GP support and her frustration at the lack of opportunity to develop.

> *'Like I say, the doctor will only go if I go in and ask a question they won't try and unpick it they'll just go with what I've come in to ask. They wouldn't say what about this, what about that? It would just be yes, just give him one at lunchtime.' (Participant 2, interview)*

Participant 13 identified a tension between identifying a learning opportunity and managing time and this was something many participants weighed up when considering whether to ask the GP for advice or refer the patient to their list.

> *'So there are two ways depending on the pressure of our clinic and the fact that I am forever, this is still a learning process for me, if they* (the GPs) *can they actually come into the room so that I can overhear what's actually happening next. But occasionally I, well actually just depending on pressures of the day, they may need to go back into the waiting room knowing that actually they're next on the list.' (Participant 13, interview)*

This was typical of the experience of participants for whom learning opportunities were highly valued but were opportunistic and dependent on available time.

4.7.2 Summary: explaining decision-making

The major influence informing participants' decision-making was their individual scope of practice. A number of factors were identified by participants as contributory and influential to this which could be broadly categorised under participant and organisational factors.

Key for participants was their confidence and perceived competence to manage the scenarios which was dependent on their previous clinical experience, exposure to similar prescribing scenarios and their underpinning knowledge. Participants expressed caution in respect of prescribing for complex scenarios; however, previous experience in a relevant clinical specialty or exposure to similar prescribing scenarios was enabling. Where participants did not feel confident and competent, they referred the patient to the GP and were unwilling to undertake prescribing decisions where they considered there to be an unacceptable risk of potential harm to the patient and risk their professional registration.

The development of knowledge was self-directed but influenced by the culture in which they worked. A few participants described a team-based approach to patients with support and mentorship available to them whilst others described working independently which required a heightened sense of autonomy and little opportunity for support or mentorship. These tended to be participants who were the most experienced prescribers and with the most primary care experience.

Participants commented on both the limitations imposed by time-limited consultations and the focus of their role on the management of acute presentations in their ability to manage complex patients and identified that more time was needed to fully assess these patients. Whilst a team-based approach was helpful in managing this, time restrictions impacted on participants' development and learning opportunities.

4.8 Conclusion

This conclusion will synthesise the findings from the analysis of the vignettes and interviews and summarise the decision-making processes, approach to consultations and influences on the participants when making decisions in situations of complexity as represented in the vignettes.

Overall, participants decision-making could be categorised into three main components: diagnostic decision-making, prescribing decision-making and the decision whether to take independent responsibility for the decision-making within the scenario. The majority of participants completed the vignettes independently with the exception of vignette 3 where most sought additional support. Vignette 3 was a scenario that represented significant risk to the majority of participants with most having limited experience of managing patients with this condition and for whom the associated complexity of the prescribing management was considered to fall outside of their scope of practice. Those that completed this vignette independently were amongst the most experienced in terms of prescribing and primary care

experience. However, these participants did not identify and address all the complexity within the scenario including key aspects such as non-adherence to medication.

Underpinning participants' diagnostic and prescribing decision-making was a mixture of intuitive and analytical processes. Intuitive decision-making was evident in diagnostic decision-making in the form of pattern recognition which informed hypothesis generation. Additionally, participants described an intuitive form of diagnostic decision-making with its roots in nursing experience described as 'gut feeling' or 'intuition' that some experienced participants drew on to enable them to manage complex diagnostic decisions. Participants showed awareness of potential bias associated with intuitive diagnostic decision-making which was apparent in their use of metacognition and adoption of an analytical process of differential diagnosis. However, despite this, some limitations of this mode of thinking were evident in the generation of hypotheses which was exemplified in the varied range of differential diagnoses considered by participants, in particular those indicative of serious disease.

Intuitive decision-making was evident in prescribing decision-making in the form of recall of the appropriate treatment for the condition, but mostly this was undertaken in conjunction with analytical processes. Where intuitive decision-making was unchecked by analytical processes there was a risk of suboptimal prescribing; however, the computer prescribing system provided some protection to counter this.

Analytical processes underpinned both prescribing and diagnostic decision-making with most participants relying on knowledge and experience to inform the process of differential diagnosis. When making prescribing decisions, the majority of participants supplemented their knowledge and experience by referring to a range of evidence-based resources in at least one of the vignettes and relied on computer prompts to inform them of drug interactions. However, some complex prescribing situations necessitated interpretation of guidelines and the use of clinical judgement. In these situations, participants were required to draw on their knowledge and experience to make a decision, with some more experienced participants drawing on gut feelings or intuition to inform their decision-making. For many participants this represented unacceptable risk and resulted in referral to the GP. Notably those participants who completed all the vignettes independently were amongst the most experienced prescribers and held the most primary care experience; however, this was not reflective of academic qualifications which were varied amongst these participants.

The scope of practice of each individual participant was a major influence in managing the vignettes. The extent to which participants felt confident and competent to make independent prescribing decisions was reliant on a sound knowledge base with most being unwilling to make a

decision in situations where they were unsure whether they possessed sufficient knowledge. However, participants did not always recognise the limits of their knowledge which resulted in a few instances of suboptimal prescribing.

Participants were self-directed in developing their knowledge base and this was achieved not only from studying, but through exposure to similar prescribing scenarios, support from GPs and access to feedback in managing complex cases. The availability of support was varied but generally more accessible to those who worked in a team-based environment. Those who were more autonomous in their practice and had less support from GPs included two participants who completed all the vignettes independently; however, this did not necessarily represent the optimal outcome for the patient.

The scope of the consultation varied amongst participants. All participants took a problem-focused approach, but some were prompted to consider broader issues such as co-morbidities and medication non-adherence within the consultations from cues in the patient history or from the observations of vital signs. This reliance on cues meant that in some instances important information such as non-adherence to medication and the implications of this in terms of the patient's presenting symptoms and for prescribing additional medication was overlooked. Where these broader issues were identified this represented an increased level of risk for some participants and necessitated involving the GP in the patient's management. This dependence on cues to determine the scope of the consultation has been shown to be unreliable and may not be appropriate in more complex scenarios.

The scope of the patient consultation undertaken was also determined by the participant's perception of risk which was closely linked to their perception of their role. Participants were clear about the limits of their scope of practice and their role and were not willing to take responsibility for decisions that fell outside of these and considered this to be the responsibility of the GP. Some participants voiced caution with regard to over-extending the limits of their role and referred to the associated risk of litigation and a lack of confidence that they would be supported by their professional body.

Time was frequently cited as a limiter of consultations with most participants being allocated only 10 or 15 minutes for appointments which was considered inadequate for complex patients and was a source of stress for participants. It was apparent that trying to screen patients and avoid complexity was unrealistic as chronic conditions can present as acute events (exemplified in vignette 3) and minor illness can become complex in patients presenting with multimorbidity and polypharmacy.

To summarise, managing complex vignettes was challenging for participants regardless of their experience and qualifications. Participants adopted both intuitive and analytical processes to support their decision-making but ultimately these were both dependent on the individual's knowledge and experience. This was particularly evident where the complexity of a scenario meant that evidence-based resources could not always be directly applied, and the application of clinical judgement was required which was a particularly challenging area for participants. Intuitive processes described as gut feeling or intuition were found to be enabling for some participants in the diagnosis and management of some complex presentations.

The availability of support to participants was varied but was generally more available to those who worked in a more team-based environment. Inevitably the most experienced participants in terms of prescribing and primary care experience comprised the few who completed vignettes independently without recourse to any support. However, although this may represent efficiency some important factors within the consultation were missed and did not necessarily equate to the best outcome for the patient.

All participants felt the pressure of seeing complex patients in time limited appointments and consequently consultations were problem focused. Participants relied on cues to prompt identification of complex aspects within the vignettes. This resulted in some incomplete assessments of complex scenarios which potentially represented significant risk to the patient. It is therefore apparent that whilst the assessment of these patients takes place in the time pressured appointments of GP practices, comprehensive assessments of complex patients would appear difficult to achieve. Analysis of these findings suggests that a flexible, team-based approach in which knowledge can be shared and developed has the potential to improve the assessment and treatment of complex patients presenting acutely to general practice. Furthermore, there is some indication that implementing a framework to structure consultations for these patients may help to ensure that important factors within the consultation are not omitted.

Key points

- Diagnostic and prescribing decision-making were underpinned by both analytical and intuitive processes.
- Intuitive decision-making in the form of gut reaction or 'intuition' can aid diagnostic and prescribing decision-making in complex scenarios.
- Sound underpinning knowledge is critical to achieve optimal prescribing decision-making.
- Knowledge is developed from experience, exposure to prescribing decision-making, self-directed learning and support and mentorship from GPs.

- The ability to independently complete vignettes varied between individual participants and was dependent on their knowledge, clinical experience and exposure. This resulted in participants demonstrating pockets of expertise in the management of some vignettes and support from the GP to complete others.
- Time restrictions impact on the scope of the consultation for complex patients and a problem-focused approach with a reliance on prompts from cues from the patient assessment presents a risk of incomplete assessments in which aspects of complexity within the consultation may be missed.
- A team approach to managing patients allows development and sharing of knowledge and may represent better outcomes for complex patients.

Chapter 5 Discussion

5.1 Introduction

This study was undertaken in recognition of the increasingly complex decisions that nurse prescribers in general practice are required to make in the management of acute presentations. The increasing prevalence of multimorbidity, which is almost universal in older adults, is a key contributor to the complexity of decision-making (National Instituite of Health and Care Excellence, 2018b). It is known that nurse prescribers in general practice have varied clinical experience and education and this study into their decision-making processes was undertaken to provide insights into the training, development and support that would most benefit this group of prescribers. In order to investigate this complex area and address the research question a novel method involving staged vignettes and think aloud was trialled and used. The research question and aim are stated below.

What are the decision-making processes of nurse prescribers in general practice when managing episodes of acute illness in patients with multimorbidity and polypharmacy?

Aim: The aim of this study was to investigate the decision-making processes of nurse prescribers in general practice when managing acute episode of illness in complex patients and explore how these nurses justify and explain their decision-making.

Findings from the study identified that participants' decision-making fell into three main categories: diagnostic decision-making, prescribing decision-making and the decision whether to autonomously manage the vignette. Diagnostic and prescribing decision-making were characterised by the use of both intuitive and analytical processes. Participants were identified as using intuitive processes that were identified as pattern recognition, recall and intuition. The use of intuition was found to enable some participants to complete complex diagnostic and prescribing decisions. Participants used analytical processes to review their competence to undertake the vignettes and referred to the GP where they considered they had insufficient knowledge or experience to complete the vignette autonomously.

Participants took a problem-focused approach to the vignettes and relied on cues from the patient history or examination to prompt the identification of complex factors. This resulted in aspects of the vignettes being overlooked by some participants.

Underpinning intuitive and analytical processes were participants' knowledge, experience and exposure to similar clinical scenarios which consequently resulted in variation in participants' abilities to complete the vignettes independently but also revealed pockets of expertise.

Most prescribing decisions were optimal but there were a few instances of sub-optimal decision-making associated with both analytical and intuitive processes. Participants reviewed their competence to manage each vignette independently and were cautious when they did not consider they had sufficient knowledge or experience and referred to the GP in these instances. This self-assessment of their competence to complete a vignette was mostly appropriate but, in a few instances, revealed insufficient knowledge. Participants' self-assessment of competence was not only informed by their knowledge and experience but was also influenced by their perception of their role, of the risk of their decision-making to the patient and their professional registration and an overall assessment of their scope of practice.

Organisational factors were found to influence participants' decision-making. Time restricted appointments appeared to encourage a problem-focused approach and participants reported that managing complex scenarios within allocated, timed appointments was a source of stress for participants. Some participants worked in a setting that adopted a team approach to the patient list and this was found to be enabling in the development of participants. Those who worked more in isolation were amongst the most experienced and completed most vignettes independently. However, this approach and heightened autonomy did not always equate to the optimal outcome for the patient.

This chapter reviews these findings in the context of existing literature on the decision-making processes of nurse practitioners (NPs) and in the context of wider decision-making theory. The term nurse practitioner (NP) is used to describe both nurse prescribers and nurse practitioners in the literature and reflects the inclusion criteria of the literature review in Chapter 2 which, due to limited research on the decision-making processes of nurse prescribers, included nurse practitioners who were in assessment and treatment roles but did not necessarily hold a prescribing qualification.

5.2 Findings and comparison to the literature

5.2.1 Decision-making processes

Three distinct categories were identified in the decision-making of study participants that contributed to the consultation: diagnostic decision-making, prescribing decision-making and the decision whether to manage the presentation autonomously. Both Abuzour, Lewis and Tully (2018c) and Burman *et al.* (2002) recognised the separate stages of diagnostic and prescribing/treatment decision-making in their studies of NP decision-making whilst Abuzour, Lewis and Tully (2018c) similarly reported a metacognitive stage in which participants considered their competence and confidence to take responsibility for the prescribing decision. Findings from this study showed that underpinning study participant' diagnostic and prescribing decision-making were both intuitive and analytical processes. This is supported by existing research findings into the decision-making processes of NPs (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003; Offredy and Meerabeau, 2005; Offredy, Kendall and Goodman, 2008; Pirret, Neville and La Grow, 2015; Chen *et al.*, 2016; McIntosh *et al.*, 2016; Pirret, 2016; Rosciano *et al.*, 2016; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c) and indicates that the overall structure of the consultation and decision-making processes used by the study participants are reflective of other NPs undertaking this role.

5.2.1.1 Recognising patterns

This study found intuitive decision-making to be characterised by pattern recognition in diagnostic decision-making. Both Croskerry *et al.* (2017) and Sox, Higgins and Qwens (2013) recognised that pattern recognition is often applied to diagnostic situations and occurs when key features of a patient presentation are identified and rapidly matched to a diagnosis which is held as an internal representation of a particular disease or as an 'illness script' (Sox, Higgins and Owens, 2013; Croskerry *et al.*, 2017). Pattern recognition is therefore strongly dependent on the experience of and exposure to a particular condition over time and where this is insufficient there is the potential for error (Croskerry, 2009b).The use of pattern recognition by study participants in diagnostic decision-making is consistent with the literature relating to NPs' decision-making processes in which the concept of identifying patterns is often identified in the diagnostic process but is expressed using varied terminology such as chunking or schema (Offredy, 1998; Burman *et al.*, 2002; Offredy, 2002; Ritter, 2003; Pirret, 2016; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c) (section 2.7.1). However, pattern recognition can also be applied to prescribing decision-making and explains how the study participants appeared to recall appropriate treatments for conditions with which they were familiar. For example, in Vignette 1

two participants appeared to instantly recall Aciclovir as the treatment for shingles and it is likely that the participants recognised patterns from clustering the cues of the diagnosis, severity of symptoms and characteristics of the patient to recall the choice of treatment. Recall applied in this way can be interpreted as a process of pattern recognition and reflects the clustering of data used to access the long term memory in IPT (see section 1.7).This process is described by Thompson, Moorley and Barratt (2017) who found NP and GP participants identified patterns from the repeated experience of identifying a condition and appropriate treatment which rendered the response automatic over time. Similarly Poss-Doering *et al.* (2020) describe pattern recognition as part of the prescribing process of GPs decision-making in which they draw on past experiences to identify patterns from factors in the patient assessment that indicate the need for a specific treatment.

Pattern recognition can be used further to explain the intuitive decision-making that occurred in response to prompts within the vignettes which uncovered complex factors. Study participants were found to take a problem-focused approach to the consultation in which the presenting physical complaint and the diagnostic process were the focus of their consultation. A consequence of using a problem focused approach was the reliance demonstrated by study participants on pattern recognition in response to cues to identify additional complex factors in the scenarios such as co-morbidities and medication adherence. Participants were seen to respond to particular cues that they recognised from previous experience prompting them to extend the scope of the consultation. This approach, being dependent on knowledge and experience, therefore resulted in inconsistent attention to these factors amongst participants. This inconsistency represented an area of considerable risk in which critical diagnostic cues and information important for prescribing decision-making could be missed. Problem focused histories are generally smaller in scope than a complete health history and follow the direction of the presenting complaint (Jarvis, 2004). This may reflect approaches to consultation that have been taught or developed from observing medical colleagues, a consequence of time limited appointments or failure to recognise complex aspects of the scenario. Furthermore, there is some suggestion in the literature that clinicians may choose to overlook some aspects of complexity (Silvério Rodrigues *et al.*, 2019).

The content of NP consultations is under-explored in the literature but there is some evidence that they undertake a more holistic approach in which they explore contextual factors such as social, lifestyle and family history (Offredy, 1998; Burman *et al.*, 2002; Thompson, Moorley and Barratt, 2017). This holistic approach was not reflected in the consultations of study participants. Although wider factors were considered by participants, this was inconsistent and generally dependent on intuitive responses to cues prompting pattern recognition. Ritter (2003), in her

study on NP decision-making, noted that expert nurses used intuitive processes to unconsciously identify and skilfully manage appropriate information from complex case studies. However, the expert nurses in Ritter (2003)'s study were presented with complete case studies with no requirement to collect information and therefore the process of cue collection was not investigated. Furthermore, the focus on expert NPs did not investigate the decision-making processes used by less experienced NPs.

This study identified unique findings through the use of staged vignettes and showed study participants to rely on intuitive processes characterised by pattern recognition to identify complex factors and prompt the need to collect more information. Whilst Ritter (2003) found that intuitive processes were effectively used by NPs, participants in this study showed variability in the collection and interpretation of complex cues. This suggests that NPs may not always have the underpinning knowledge and experience to approach complex presentations in this way and there is an indication that a more structured and comprehensive approach to history taking which routinely encompasses issues such as medication adherence and social history would be beneficial in managing complex presentations.

5.2.1.2 Using intuition or 'gut feeling'

The concept of 'intuition' was referred to by some participants when reflecting on their decision-making. Descriptions of intuition by participants took two distinct forms, some described a process of 'immediate knowing' which can be explained by rapid pattern recognition reliant on knowledge and experience, whilst others referred to an instinctive impression of a patient's condition without identification of distinct cues which had been informed by years of accumulated nursing experience. Offredy (1998), in her study of NP decision-making similarly identified these two separate processes but asserted that pattern recognition occurred at a conscious level whilst intuition occurred unconsciously. Intuition within the literature is often identified as a unique concept when describing NPs decision-making processes (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003; Chen *et al.*, 2016; Rosciano *et al.*, 2016; Williams *et al.*, 2017) and is frequently described as a gut feeling, instinct or presentiment that guides decision-making which is subtly different to pattern recognition. Subtly different then to pattern recognition, and reflecting Offredy's (1998) definition of intuition, some participants recognised a more instinctive process of assessment described as gut feeling that incorporated experience and knowledge not only from their experience in undertaking medical aspects of their role but experience acquired throughout their nursing career.

The use of gut feeling was approached with caution by some of the less experienced participants but conversely was shown to have particular significance to a few of the more experienced participants in the diagnosis and management of some complex scenarios which fell outside of guideline recommendations and was identified as a key to decision-making by these participants. Ruzsa, Szeverenyi and Varga (2020) identified the necessity for intuitive judgement including both pattern recognition and gut instinct in the management of complex presentations. This was similarly identified by Williams *et al.* (2017) in their study of GP and NPs' antibiotic prescribing where 'gut feeling' was used as a strategy by GPs in managing complexity but was considered an area of risk for NPs, and such patients were considered more suitable to be managed by GPs. In this study the use of gut feeling was recognised as an area of risk by those participants who were less experienced prescribers; however, for a few of the most experienced participants it was shown to be a valuable tool in managing the uncertainty present in complex situations.

5.2.1.3 Bypassing analytical decision-making

Participants showed awareness of the risk of reliance on intuitive processes and recognised the potential for the influence of bias and risk of error (Croskerry, 2009b) consequently intuitive processes were mostly used in conjunction with analytical processes. There were, however, instances where intuitive processes were used with minimal recourse to analytical thinking. This was seen mainly in response to vignette 1 where the presentation of shingles was distinct and its treatment familiar to some participants prompting pattern recognition. This is similar to findings by Offredy (1998) who found pattern recognition to be the dominant process used for low consequence diagnoses. Study participants were quick to recognise the diagnosis but even so continued to collect cues to test the hypothesis. This analytical process of hypothesis testing reflects the hypothetico-deductive model (Higgs and Jones, 2000). However, this was more confirmatory than to consider differential diagnoses. Confirmation bias is a well-known cognitive bias in which new information is interpreted to confirm rather than challenge a preconceived diagnosis and therefore there is a risk that alternative diagnoses will not be considered (O'Sullivan and Schofield, 2018). However, Croskerry *et al.* (2017) considered that the accuracy of pattern recognition increases where a disease is highly pathognomic, that is where physical signs and symptoms are distinct characteristics of a disease as in shingles; therefore this approach was arguably appropriate and efficient.

Conversely, in prescribing decision-making in the few instances where intuitive processes were used without the support of analytical processes, there was evidence of suboptimal prescribing. This only occurred in response to vignette 1 and only by two participants. After making a diagnosis both participants instantly recalled treatment from patterns recognised within the patient

presentation and, without initiating any checks, verbalised the correct drug to prescribe, but for a suboptimal course duration. Offredy, Kendall and Goodman (2008), in their study of NPs, identified error associated with a reliance on intuitive processes for prescribing. However, this was related to NPs being asked to prescribe outside of their usual area of practice and having insufficient knowledge and experience to do this. In this study, both participants associated with this error reported here were very experienced practitioners and had considerable experience on which to draw. In this case it appears that over time, through repeated exposure to similar prescribing decisions, the associated analytical process was transferred to an intuitive process but at some point an error in the pattern of recall occurred which had been allowed to continue unchallenged (Croskerry, 2009b). Mitigating this risk to some extent is the electronic prescribing system which was used by all participants to generate the final prescription in the vignettes and acted as a trigger to use analytical processes. Although the system would not give any indication as to which drug to choose it is likely to suggest appropriate doses and course duration of drugs, prompting the clinician to further consider their decision and reduce the risk of error (Pearce and Whyte, 2018).

5.2.1.4 Taking an analytical approach: diagnostic decision-making

Vignettes 2,3 and 4 presented more complex diagnostic challenges and study participants initiated an analytical approach of differential diagnosis following the initial intuitive response of pattern recognition. Participants identified potential alternative diagnoses by drawing on their knowledge and experience and then tested the likelihood of these using key signs and symptoms from the patient's history and examination. This resembles the hypothetico-deductive model of diagnostic reasoning in which hypotheses are generated and revised in the context of clinical data (Elstein and Schwarz, 2002). The use of hypothesis testing by nurse practitioners is reflected in much of the NP decision-making literature (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003; Pirret, 2016; Thompson, Moorley and Barratt, 2017; Abuzour, Lewis and Tully, 2018c) including studies whose focus was on complex scenarios (Ritter, 2003; Pirret, Neville and La Grow, 2015). Study participants justified their use of this approach in its protective qualities against potential bias from relying on pattern recognition. Pirret, Neville and La Grow (2015) similarly recognised the importance of an analytical approach to diagnosis in complex cases and found inexperienced NPs undertook an intuitive approach where the complexity of the situation required a more analytical approach and thereby were at risk of premature closure in their diagnostic decision-making. This cognitive bias occurs when insufficient attention is given to consideration of alternative diagnoses and is a common cause of diagnostic error (Graber, Franklin and Gordon, 2005).

The diagnostic process was undertaken by participants without the support of resources and most made appropriate diagnoses in response to the vignettes which reflected the familiarity of the vignette presentations to the study participants; however, there was considerable variation in the range of differential diagnoses generated by participants in response to each vignette. This process, without reference to supporting literature or online resources, is dependent on an individual's knowledge and clinical experience to appropriately interpret data and cues (Elstein and Schwarz, 2002).

Although most participants made appropriate diagnoses despite the inconsistent consideration of differential diagnoses, the variation in differential diagnoses that were generated revealed an inconsistent approach to the assessment of 'red flags' which can be defined as signs and symptoms indicative of serious disease (Schroeder, Chan and Fahey, 2011). This was clearly shown in vignettes 2 and 4 where less than half the participants considered potential serious differential diagnoses in either vignette and only one participant considered these in both. Those participants who considered serious illnesses within their differential diagnoses appeared to do so either in response to specific cues in the consultation or as part of an analytical process of ruling out serious disease. Both approaches are reflected in the literature. Marsden (1999), in his study of specialist ophthalmic NPs, described how consideration of serious diagnoses was prompted by triggers from red flags (signs and symptoms indicative of serious disease) within the consultation suggesting an intuitive approach based on pattern recognition rather than an active search for red flags based on an analytical review of potential serious diagnoses. Burman *et al.* (2002) similarly described primary care NPs responding intuitively to prompts within the history and examination but there was evidence of some participants taking a more analytical approach to ruling out serious disease. Actively ruling out serious illness and searching for red flags within the consultation is of key importance in respect of patient safety (Schroeder, Chan and Fahey, 2011) and is protective against premature closure. Both the analytical and intuitive processes described above, without the use of resources, are dependent on the knowledge and experience of individual practitioners. Whilst this might be appropriate where practitioners have expertise, this study shows that expertise for the majority of study participants was case dependent and therefore this approach presents potential risk to the patient. There is an indication that participants need increased awareness of areas where their knowledge is insufficient and encouragement to use resources to support their diagnostic decision-making when dealing with complex patient presentations.

5.2.1.5 Taking an analytical approach: prescribing decision-making

After the initial identification of the appropriate drug to prescribe, prescribing decision-making was mostly informed by analytical processes. Participants considered the proposed treatment in the context of allergies and drug interactions and additionally weighed up whether they felt competent to prescribe for the patient or to refer to the GP. Notably participants were prompted to take an analytical approach by the electronic prescribing system which alerted participants to recorded drug allergies and drug interactions. This resource was frequently relied upon by participants to identify allergies and interactions. Carter, Chapman and Watson (2021) describe a mixed response from general practice-based prescribers to computer prompts identifying the benefit of being alerted but also a risk of being overwhelmed by the content. Notably these warnings only served as a prompt but did not give solutions and for some study participants, this identified a level of complexity that necessitated a referral to the GP.

The importance of the electronic prescribing system in alerting participants to potential interactions was exemplified in an example of sub-optimal prescribing by one of the participants who, having recognised familiar cues within the assessment, identified a treatment and advised the patient to buy this medication over the counter, consequently bypassing the electronic system. In this case pattern recognition was triggered and resulted in premature closure of the analytical process of prescribing decision-making before considering drug interactions and the co-morbidities of the patient, and resulted in the recommendation of a potentially harmful drug.

Participants inconsistently used resources such as drug formularies to support the analytical process of prescribing and where only knowledge and experience were relied on to inform the prescribing decision, there were twice as many instances of suboptimal prescribing. Situations arose where, due to the complexity of the prescribing decision, resources were not always helpful and required interpretation for which some study participants drew on their knowledge and experience, whilst others referred to the use of intuition, but in many cases this resulted in referral to the GP.

Offredy, Kendall and Goodman (2008) found inappropriate prescribing occurred where NPs made decisions outside of their area of practice and were denied access to resources, suggesting that relying on their pharmacological knowledge base alone was not sufficient and expertise is acquired where there is sufficient exposure to and experience of clinical situations. Abuzour, Lewis and Tully (2018c) found that participants used members of the multi-disciplinary team as a resource to support their decision-making and that they lacked the confidence and competence to make a final autonomous decision, suggesting inadequate knowledge and experience. However, this may be more reflective of the team-based secondary care setting which differs to

that of the majority of study participants for whom access to support was less available. McIntosh *et al.* (2016) described instances where experienced NPs did not strictly adhere to evidence-based guidelines and drew on experience to inform their decisions in situations of clinical uncertainty or where there was a high risk of complications. This is similar to findings from Williams *et al.* (2017) where it was acknowledged that complex presentations required interpretation of guidelines; however this was perceived as too risky for NPs and these patients were referred to the GP. This supports this study's finding that in complex prescribing decision-making resources such as guidelines and electronic prescribing systems are not always sufficient to support prescribing decision-making. Clinical and pharmaceutical knowledge alongside experience and exposure to similar prescribing situations is required to enable the interpretation of the many factors contributing to complex prescribing decisions and not all study participants had sufficient breadth of experience or exposure to complete all the vignettes.

5.2.1.6 Underpinning cognitive processes: knowledge, experience and exposure

Theoretical knowledge gained from courses and independent learning was considered important by study participants in supporting their decision-making but the development of this knowledge from mentorship and exposure to scenarios and the ability to draw on past clinical experience were key to participants' perceptions of competence and confidence. This is well supported in the literature (Offredy, 1998; McIntosh *et al.*, 2016; Abuzour, Lewis and Tully, 2018a; Djerbib, 2018) where concepts such as prior experience and familiarity with particular clinical presentations are shown to enable autonomous prescribing decisions. The significance of these factors to the study participants' decision-making is exemplified by their readiness to refer to the GP where they did not consider they had sufficient confidence or competence and this self-assessment is reflected in the literature (Offredy, Kendall and Goodman, 2008; Abuzour, Lewis and Tully, 2018a; Djerbib, 2018). Notably there was no apparent relationship between academic qualifications and the ability to independently and appropriately complete the vignettes.

The importance of experience and exposure is exemplified in the pockets of expertise seen amongst the participants. The variation shown by individual participants in their ability to complete some complex vignettes and yet be unable to complete others demonstrates the importance of clinical experience and exposure to similar clinical scenarios. Thompson, Moorley and Barratt (2017) similarly recognise the importance of exposure to a range of clinical conditions in developing NPs' confidence in decision-making. This was also acknowledged by participants themselves who cited knowledge, clinical experience and exposure to prescribing scenarios as important factors underpinning their decision-making.

Hooks and Walker (2020) and Evans *et al.* (2020) in their studies of advanced clinical practitioners (ACPs) in primary care found them to have individualised and variable training experiences which required their scope of practice to be negotiated at an individual level. This is reflected in the findings of the study participants who had different clinical backgrounds and a range of experience which were not always sufficient to manage the range of conditions in the vignettes. This study also identified that some participants had made attempts to limit the range of conditions that presented to them; however, this proved unrealistic and generally being asked to see presentations that they considered outside of their scope of practice was a source of frustration. Some participants described a team approach to the patient list which allowed them to select patients they felt were appropriate to manage, but they were in the minority. There is an indication that nurse prescribers may be inadequately prepared to manage the range of complexity that presents to general practice and either a more uniform training that reflects that of GPs or a review of working practices to encourage a more team-based approach may enhance efficiency and improve patient experience and outcomes.

5.2.1.7 Autonomy

Study participants demonstrated different degrees of autonomy in the completion of vignettes. Autonomy can be described as having the freedom to make independent clinical decisions in the best interest of the patient within a self-defined scope of practice (Kramer and Schmalenberg, 2008). Working at high level of autonomy is a defining feature of advanced practice (Health Education England, 2017); however, the use of 'high level' implies this to be a relative concept rather than absolute and as such dependent on individual experience. This was reflected in the study participants' ability to independently complete vignettes which was dependent on their knowledge, experience and exposure. Whilst participants demonstrated full autonomy in respect of some vignettes this did not necessarily translate to others.

This study has shown participants to have a wide range of qualifications (section 4.2.4), including some relatively inexperienced participants and some who had limited post qualification education yet had years of experience in their role and it is therefore difficult to define their level of practice. However, it is representative of characteristics across the enhanced and advanced levels of practice as defined by Health Education England (2021) (section1.5) with some participants demonstrating higher levels of autonomy than others. The broad scope of clinical presentations faced in general practice alongside the diverse clinical experience and educational backgrounds of nurse prescribers in these role means that autonomy is unlikely to be absolute, even in the most experienced of practitioners, and this is exemplified in the mixed ability of the study participants to complete all the vignettes independently.

5.2.1.8 Deciding to refer

Generally, participants were clear about the limits of their competence and referred to the GP situations which they were not confident to complete. This theme is reflected by Abuzour, Lewis and Tully (2018c) in their study of NP decision-making that identified a stage in which NPs reflected on their competence and confidence to decide whether to take responsibility for the prescribing decision. Responses to the majority of vignettes showed study participants to be cautious, and ready to refer to the GP to avoid taking unnecessary risk. This is similar to findings of Djerbib (2018) and Maddox *et al.* (2016) who found NPs reluctant to prescribe in complex scenarios which they perceived as high risk whilst Carter, Chapman and Watson (2021) found NPs to be generally more risk averse and considered GPs to be best placed to manage complex patients. However, tolerance of risk in prescribing some medications differed amongst participants in this study and could be linked to their individual knowledge and experience of prescribing particular drugs. There were a few instances of suboptimal prescribing that could be attributed to the participants' failure to identify where they lacked sufficient knowledge to safely complete all aspects of the prescribing decision. There is a suggestion that the unique position of general practice nurse prescribers that requires them to work to an individual list of patients and manage a wide range of presentations without the team approach common to secondary care prescribers may result in them undertaking a level of autonomous practice that they do not always have the knowledge or skills to support.

5.2.1.9 The influence of participants' characteristics

The ability to autonomously complete scenarios has been linked to the study participants' perceived competence and confidence which was dependent on their knowledge, experience and exposure to similar clinical situations. In addition, however, there was a noticeable difference in the approach of some participants. Two participants completed all four vignettes without seeking any support or advice and exhibited highly autonomous decision-making. These were two of the most experienced participants who considered themselves independent from the GP and reported little need to consult them and additionally were mindful not to contribute to the GPs workload. This did not however necessarily represent the best outcome for the patient and was associated with sub-optimal decision-making, particularly in respect of vignette 3, a scenario shown to be challenging for all participants. Neither participant identified the key issue of non-adherence to medication and experienced uncertainty in reaching a diagnosis. Consequently, they took a pragmatic decision to manage the patient's hypotension, give worsening advice and arrange review. Whilst this approach was not unreasonable, consulting the GP or seeking

specialist advice (as demonstrated by participants 1,7 and 8) may have identified the key factor of non-adherence to medication that was driving the patient's symptoms and consequently resulted in a quicker improvement in the patients' symptoms. This difference of approach which represents an example of satisficing, that is doing what is satisfactory and sufficient (Stokes *et al.*, 2017), shows an ability to tolerate uncertainty which can be explained by the individual characteristics of the participants.

Personality traits are recognised as influencing decision-making and are identified as a source of influence on decision-making (Saposnik *et al.*, 2016; Croskerry *et al.*, 2017). Saposnik *et al.* (2016) identified tolerance of ambiguity and aversion to risk as common personality traits in medical decision-making, and both these traits can be identified amongst study participants. Aversion to risk resulted in referral to the GP for some participants whilst tolerance of ambiguity resulted in efficiency for some participants but did not necessarily offer the optimal outcome for the patient. Moreover, a consequence of this efficiency is the loss of opportunity to develop knowledge that these participants may have gained from discussing the case with a colleague.

5.2.2 Organisational influences

Overarching a number of influencing factors on study participants' decision-making was the reported impact of the organisation in which the participants worked. This influenced the individual's perception of their role and scope of practice and in addition the clinic set up and imposition of time limited consultations which were found to have a notable impact on participants' decision-making.

5.2.2.1 Influences of time

Most participants undertook patient assessments in a time-limited clinic which focused on managing acute presentations with little regulation over the type of conditions that might present. Participants' perception of how they perceived their role was of importance in determining the scope of the consultation. Some participants, despite being involved in chronic disease management clinics, did not consider that they had the time to address issues related to these conditions in acute clinics and described how they would prioritise the acute presentation in these consultations. The influence of time restrictions is reflected in the literature. McIntosh *et al.* (2016) and Williams *et al.* (2017) described NPs feeling pressured to prescribe antibiotics due to time restricted appointments whilst Pirret, Neville and La Grow (2015) found poor diagnostic ability in complex scenarios to be linked to those who completed them in the shortest time. This shows time pressures to be detrimental to decision-making. Stokes *et al.* (2017) found time-limited appointments resulted in primary care clinicians adopting an approach of 'satisfactory and

sufficient' care for complex patients, a theme supported by Damarell, Morgan and Tieman (2020) who found GPs only able to tackle acute concerns in patients with multimorbidity due to time limited appointments. In addition, it was found that time limitations were a source of stress when managing such patients who, despite modifications in the approach to the consultation, usually took more time (Stokes *et al.*, 2017).

Within the current study it was similarly found that participants did not actively seek to manage complex factors within the consultation but rather responded to intuitive prompts from pattern recognition. This is likely to reflect participants' awareness of the impact of complex patients on their time management. Even then some participants chose to respond to such prompts in the context of the presenting complaint rather than acknowledge additional complexity which may have been difficult to manage. This avoidance of addressing the complexity of multimorbidity is considered by Silvério Rodrigues *et al.* (2019) as a possible characteristic of the individual decision-maker rather than representing a lack of knowledge. However, there were some participants who showed considerable skill in navigating complexity within some of the vignettes, a finding supported to some extent by Ritter (2003) who identified expert NPs could intuitively negotiate complex factors within a consultation. Even so, areas of expertise varied between study participants and in order to complete the scenario a satisficing approach, as described by Stokes *et al.* (2017), was taken in the majority of cases and resulted in important factors within the scenarios being overlooked. This suggests that acute, time-limited clinics may be insufficient to manage the growing complexity of primary care presentations and other approaches that allow for flexibility in timings and use of clinicians' skills should be sought.

5.2.2.2 Availability of support

Participants described varying degrees of support from GPs with some having infrequent contact and others describing a supportive team approach. Half of the participants described working independently without ready access to the GP and infrequently requiring their support whilst some participants described a more team-based approach where GP mentorship was available. The value of developing practice through mentorship from GPs was recognised by most study participants but this was often comprised by the pressure of time limited appointments.

The importance of clinical support from colleagues in developing prescribing practice is well documented in the literature (McIntosh *et al.*, 2016; Djerbib, 2018; Evans *et al.*, 2020). Experience of and exposure to clinical scenarios has been shown to be of key importance to the sound application of cognitive processes (Thompson, Moorley and Barratt, 2017). Furthermore, development of expertise is only achieved if there is the opportunity to develop knowledge through appropriate feedback (Kahneman, 2011; Croskerry *et al.*, 2017) and therefore support

from GPs, particularly in complex decision-making, is fundamental to equip primary care NPs to manage the array of presentations they encounter and yet its provision varies between individual GP practices (Evans *et al.*, 2020).

5.2.2.3 Knowing the patient

Some participants described how knowledge of the patient was enabling in decision-making and the management of risk. Participants described having prior knowledge of a patient's medical history and their previous responses to episodes of illness increased their confidence to manage complex presentations (see section 4.7.1.1.1.4). Risk associated with making prescribing decisions without prior knowledge of the patient is identified in the NP literature by McIntosh *et al.* (2016) who found NPs experienced increased pressure to prescribe antibiotics where they did not know the patient and Williams *et al.* (2017) who found that the uncertainty associated with limited access to patient records increased the imperative to make a correct prescribing decision. Damarell, Morgan and Tieman (2020), in their systematic review of GPs experience of managing of multimorbidity, found relational continuity, that is knowing the patient, was a key factor in helping to manage the risk associated with this group of patients. Continuity of care is also clearly of importance in enabling NPs to manage complex patient presentations.

5.2.3 The influence of risk

Managing risk was found to have a major influence on the decision-making of participants in this study. The preceding sections (5.2.1, 5.2.2) have identified factors from the findings in this study that impact the management of risk for NIPs in situations of complexity. These can be categorised as individual practitioner characteristics such as tolerance of uncertainty and the quality of underpinning knowledge, the appropriate application of decision-making processes and organisational factors such as the availability of support and clinic structure.

Participants considered decisions to be risky where the potential of harm to the patient was perceived as high and where this may have had implications for their professional registration. Consequently, participants were generally cautious in their approach to prescribing decision-making and referred such decisions to the GP. This caution is reflected in other studies of NIP decision-making (Bowskill, Timmons and James, 2013; Maddox *et al.*, 2016; Djerbib, 2018). Bowskill, Timmons and James (2013) found general practice NIPs perceived the wide range of conditions for which they could potentially prescribe to represent an area of risk and consequently self-imposed restrictions on their prescribing scope of practice. This study similarly found that some participants attempted to impose restrictions on the range of presentations that were allocated to their clinics. Determining an individual scope of prescribing practice is a

requirement of the RPS competencies (Royal Pharmaceutical Society, 2021) and for NIPs working in general practice who face a wide range of presentations, this will inevitably mean that they will be required to refer to another clinician to complete some consultations. Management of risk in this study, which was represented by referral to the GP where situations were considered out of participants' prescribing scope of practice, in the majority of cases represented safe practice.

Bowskill, Timmons and James (2013) identified the importance of establishing trust in prescribing relationships with doctors who in general practice are often also employers. Trust in this context was defined as NIPs' expectation of support from doctors in situations that increased their vulnerability which in this case was integrating their role as prescribers (Bowskill, Timmons and James, 2013). This trust was shown to be important in developing confidence in prescribing practice and key in the willingness of NIPs to manage risk. Where trust was not established NIPs were unwilling to take responsibility for prescribing decisions in situations that they perceived as risky and, similar to findings from this study, they prioritised protecting their professional registration over the benefit to the patient (Bowskill, Timmons and James, 2013). Participants in this study reported varying levels of support from GPs with the most autonomous practitioners requiring little support. What was not explored in this study was the level of trust in the relationships participants had with GPs, and it is possible that this may have influenced participants' willingness to accept risks in prescribing decision-making.

Participants used both analytical and intuitive processes to inform their decision-making, but these were not always optimal for the patient and the use of intuitive processes where there was insufficient experience to support their use represented an area of risk. The risk of error when intuitive processes are used without sufficient underpinning experience is identified by Croskerry (2009a). Participants adopted a problem-focused approach and were found to rely on intuitive processes such as pattern recognition to determine the content of the consultation and as such important elements that impacted on the diagnosis and the management of the patient's condition were overlooked by many participants. Despite previous studies indicating that NIPs take a more holistic approach to prescribing consultations than other prescribers (Stenner, Courtenay and Carey, 2011; Riley *et al.*, 2013; Thompson, Moorley and Barratt, 2017) this was not reflected in the findings of this study.

Organisational factors such as time restrictions have been shown to prompt the use of intuitive processes (Croskerry, 2009a) and the time limited appointments imposed on the consultations of most participants in this study may explain the use of pattern recognition as a short cut to identify complex factors within the consultation. Despite the cautious approach of participants to managing risk in prescribing consultations and their awareness of the potential for bias in the use of intuitive processes (5.2.1.3), many did not consider the underpinning processes they used to

determine the content of their findings and were unaware of the impact of failing to consider wider factors in complex presentations. This risk, generated from the use of intuitive processes to determine the content of a consultation in situations of complexity, is a unique finding in the NIP literature and highlights an area of risk for NIPs when managing complexity. This suggests that although studies have shown NIPs to be safe prescribers in more simple scenarios (Latter *et al.*, 2010), this study supports findings of Naughton *et al.* (2013) in the identification of risk associated with NIP prescribing for complex presentations.

In summary, overall, risk was managed appropriately by referral to the GP where participants perceived they were required to make decisions that were outside of the prescribing scope of practice. However, there is evidence that NIPs may restrict their prescribing practice where trusting relationships are not developed with GPs whilst conversely there is potential for NIPs to become more confident in managing risk where such relationships exist (Bowskill, Timmons and James, 2013). The level of trust in participants' relationships with GPs was not fully explored in this study and warrants further investigation. Finally, the majority of study participants were shown to introduce risk into the consultation by the inappropriate use of intuitive processes to determine complex factors within the consultations and consequently important factors were overlooked. This risk may reflect individual cognitive approaches or may be a consequence of time limited appointments. Overall, these findings emphasise the importance of good relationships with GPs to develop prescribing practice and competence and highlight a need for more time to be allocated to consultations with complex patients and for NIPS to be encouraged to use structured consultation tools to support their assessments.

5.2.4 Application of decision-making models to explain nurse prescribers' decision-making processes

Study participants were shown to use a combination of intuitive and analytical processes to inform their decision-making. Much of the literature attempting to explain the underpinning cognitive processes of nurse practitioner decision-making focuses on the application of different models of decision-making, predominantly Information Processing Theory (IPT) and the Intuitive-humanistic model (Benner, 1984) (see section 1.7). Dual processing theory can be considered a class of IPT (Stanovich, 2019) and incorporates intuitive and analytical decision-making. represented by Type 1 and Type 2 processes respectively. Croskerry (2009c) adapted this theory to represent diagnostic decision-making and demonstrated a dynamic interaction between

intuitive and analytical processes. This model (Figure 18) can be similarly applied to understand doctors' prescribing decision-making (Bate *et al.*, 2012; Poss-Doering *et al.*, 2020).

Figure 18 Croskerry's dual processing model

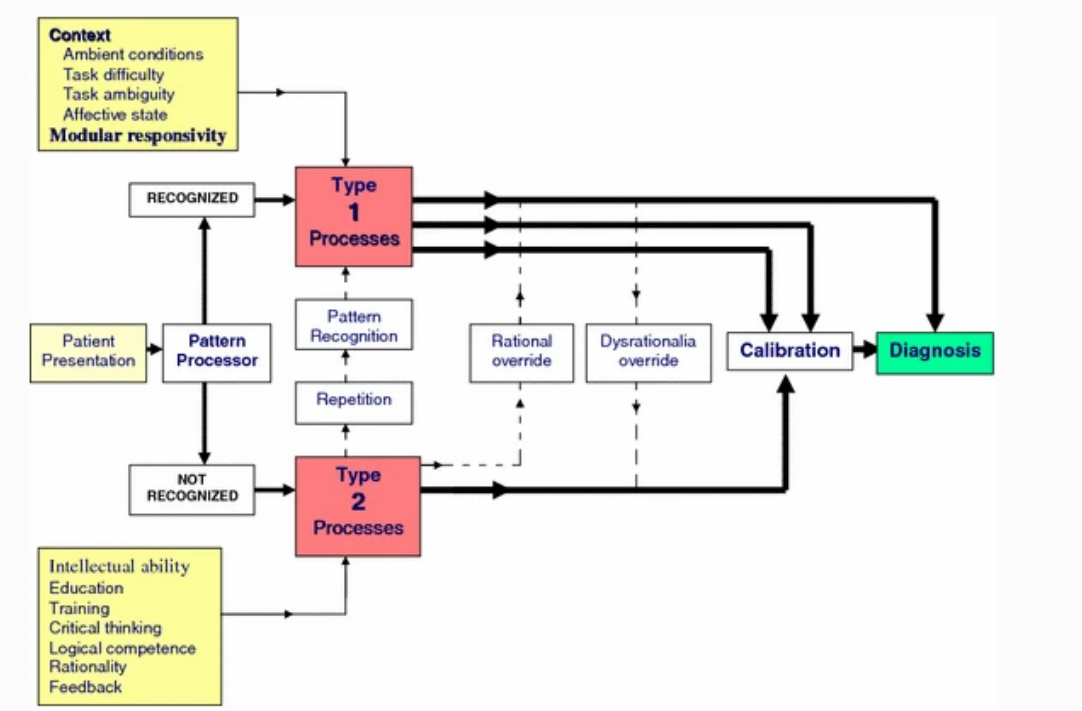


Fig 1 (Croskerry, 2009c)

Analysis of the findings of this study indicates that dual processing theory and specifically Croskerry's (2009c) adapted model can be effectively applied to develop understanding of both the diagnostic and prescribing decision-making processes of the study participants. The interaction of intuitive and analytical processes is clearly demonstrated by participants and the influence of contextual and person characteristics (depicted in yellow boxes) has enabled understanding of their cognitive processes. For example, in diagnostic decision-making participants generated initial hypotheses using pattern recognition, a Type 1 intuitive response; however 'rational override' from Type 2 analytical processes prompted a process of hypothesis testing. These Type 2 processes are shown to be dependent on the knowledge, experience and exposure of the participants which are represented by the lower yellow box and explains the variation in the generation of differential diagnoses.

Croskerry's model shows the appropriateness of Type 1 processes to be dependent on contextual factors (upper yellow box) such as 'ambient conditions'. This was exemplified in study

participants' use of Type 1 processes to identify complex factors within the vignettes. The application of Type 1 processes can be inappropriate when this is dictated by influences such as the pressure of time. In a situation with ambient conditions, the use of Type 2 processes may have become dominant and resulted in more consistent and reliable responses.

Prescribing decision-making can also be represented by this model. Participants used pattern recognition to recall the appropriate treatment, but then 'rational override' prompted an analytical process of reviewing interactions and allergies. In some instances, the electronic prescribing system was used as a 'calibration' tool and was relied on by participants to prompt interactions and to warn them of allergies. Furthermore the 'calibration' effect of electronic prescribing has potential to prompt analytical processes in situations where pattern recognition is used as the sole process to inform their decision-making which was exemplified in this study.

However, Benner (1984)'s intuitive-humanistic model, which evolved from studies of nurse decision-making and in which the concept of intuition is regarded as a hallmark of expertise, requires consideration. Study participants differentiated intuition from other cognitive processes and described an instinctive reaction or gut feeling that informed their decision-making. This is similarly reflected in the nursing literature (Offredy, 1998; Marsden, 1999; Burman *et al.*, 2002; Ritter, 2003; Chen *et al.*, 2016; Rosciano *et al.*, 2016) in which the intuitive humanistic model is often used alongside IPT to interpret nurse practitioner decision-making (Offredy, 1998; Marsden, 1999; Ritter, 2003). This somewhat confusing picture can be understood by acknowledging that information processing theory is rooted in medical decision-making whilst Benner's (1984) intuitive-humanistic model evolved from studies of nurse decision-making.

The use of both models to explain nurse practitioner decision-making is reflective of the extended scope of practice undertaken by these practitioners which is considerably developed from that of their initial registration and necessitates the acquisition of skills traditionally in the medical domain (Brook and Rushforth, 2011). Nurse practitioner decision-making is representative of both models with decision-making processes evolved from traditional nurse decision-making and acquired diagnostic and prescribing decision-making skills. This is reflected by study participants, particularly those with most experience who were confident to draw on nursing experience as well as diagnostic and prescribing knowledge to inform their decision-making. Both Benner, Tanner and Chelsa (1996) and Croskerry *et al.* (2017) identified intuitive processes as key components of expert decision-making. However, Croskerry (2009c)'s dual processing model acknowledges and encompasses both models in its recognition of concepts of preconscious affective dispositions and intuition and describes these as occurring alongside pattern recognition

as a Type 1 process. As such this model can be used as a basis to understand all aspects of the study participants' decision-making processes.

5.2.5 Expertise

The study findings showed participants drew on both intuitive and analytical processes to inform their decision-making. These were mostly used appropriately resulting in safe outcomes, but there were instances that have been outlined above where the use of intuitive and analytical processes revealed a lack of underpinning knowledge and experience, whilst the high rate of referrals for some vignettes indicated a potential training need. All participants demonstrated different abilities with evidence of expertise in relation to some vignettes and not others. For example, some were able to effortlessly negotiate potential interactions with warfarin whilst for others this was the factor that necessitated referral to the GP. Similarly the same participant could demonstrate expert ability in tackling some of the vignettes but be unable to complete another. Kahneman (2011) considered intuitive expertise as representative of a collection of skills rather than a single attribute and recognises that the same individual can be an expert in one area of their specialty whilst a novice in others. This expertise is developed from quality and timely feedback and the opportunity to practice the skill (Kahneman, 2011; Abuzour, Lewis and Tully, 2018b). This is reflected in the decision-making of study participants for whom knowledge, clinical experience and exposure to similar presentations was fundamental to their ability to complete the vignettes.

Croskerry *et al.* (2017) described the use of pattern recognition as a hallmark of expertise in diagnostic decision-making where it has been developed through experience and exposure over time and includes the active development of knowledge and the passive accumulation of tacit knowledge. The use of pattern recognition by study participants did not just apply to diagnostic decision-making but equally to prescribing decision-making and to the identification of additional complex factors within the vignettes. Whilst pattern recognition was enabling and reflected expert decision-making in some instances, there were examples where its application was not reliable, and this introduced some risks into the decision-making process. This was exemplified in the reliance on pattern recognition to identify additional complex factors within the vignettes.

This highlights a particular challenge faced by primary care NPs whose role is to assess patients presenting with acute, undifferentiated conditions in a population in which multimorbidity and polypharmacy are increasing and for whom guidelines aimed at supporting decision-making often fail to encompass many of the factors associated with complexity making their application challenging (Rodrigues *et al.*, 2013; Damarell, Morgan and Tieman, 2020). The vast range of

conditions that present to general practice and increasing multimorbidity and associated complexity means that development of expertise is not achievable in all areas and yet the complexity and uncertainty associated with such patients forces the use of intuitive reasoning (Stolper *et al.*, 2021). This is further complicated by the inconsistent training and experience of NPs in general practice and the imposition of time-restricted appointments. It is therefore unsurprising that the use of intuitive Type 1 processes is associated with risk, as it would be difficult to achieve such a broad level of expertise across the range of potential presenting conditions, or that underpinning knowledge is not always adequate. Equally unsurprising, when working in a time pressured environment, is the tendency of NPs to use quicker Type 1 processes and to adopt a modified satisficing problem-focused approach to complex presentations. This further indicates the need for a review of working practices in GP surgeries to consider the optimal way to manage acute presentations in a population of increasing complexity and a reassessment of the training, support and development available to nurse prescribers undertaking this role.

5.2.6 Interpreting the consultation

In this study participants have been shown to take a largely problem focused approach to the patient consultation. This is representative of the biomedical model of illness which is reductionist in its focus on identifying the simplest possible cause for the patient's symptoms and assumes that illness is a direct cause of disease, and overlooks the psychological and social influences on illness (Wade and Halligan, 2004). Whilst study participants were shown to consider social factors within some of the vignettes, this was not routinely undertaken and was mostly reliant on intuitive responses to cues within the consultation. This approach has been shown to be unreliable and resulted in important cues being overlooked.

Two participants referred to the use of consultation models (section 4.3) but had adapted these and no longer used these in a formal way. Consultation models have their foundations in general practice and provide a framework for the consultation, aid reflection and help protect against omissions (Denness, 2013). There are a wide variety of consultation models which have different strengths, an example of which is the Calgary Cambridge model (Kurtz *et al.*, 2003) which integrates communication skills into the consultation, is patient focused and includes psychological and social aspects of the consultation (Denness, 2013). The use of this model not only provides structure to the consultation but encourages the clinician to respond to verbal cues from the patient which give valuable insights into the patient's perspective of their presenting problem. This highlights a limitation of this study in which the use of vignettes did not give participants the option to respond to verbal cues and therefore limited this aspect of their

consultation. Even so, this study suggests that the use of a consultation model to structure consultations, protect against omissions and enable reflection may be of value in the assessment of complex patients.

5.2.7 Summary

Review of the study findings in the context of the literature has shown many similarities in the decision-making processes of study participants to those of other nurse practitioners in other settings managing varying degrees of complexity. However, the findings have also revealed distinct challenges for nurse prescribers in the management of acute presentations in complex patients presenting to general practice. In addition, the novel use of stage vignettes in this study has enabled insights into the decision-making processes used by NPs to determine the content of complex presentations.

The application of dual processing theory and Croskerry (2009c)'s model helps explain the interaction of intuitive and analytical processes used by study participants in both diagnostic and prescribing decision-making, whilst the use of consultation models has the potential to provide a framework and protect against omissions in the patient consultation.

The NP literature clearly supports the study findings of the importance of knowledge, experience and exposure in informing both analytical and intuitive decision-making to achieve safe decision-making. However, this study has shown that general practice nurse prescribers may be underprepared to manage the range of complex conditions presenting to them in acute clinics and lack the breadth of knowledge and experience required to undertake this role under their current working conditions. Furthermore, the expectation to autonomously run a clinic with time limited appointments encourages a problem focused approach and a dependence on intuitive processes to identify complexity which is shown to be unreliable and dependent on the knowledge and experience of the individual. In addition, the pressure of time limits the opportunity for the support and development of nurse prescribers.

This study gives a clear indication that the working practices of nurse prescribers in these roles needs reviewing, and the findings suggest that adopting a more flexible team-based approach to managing complexity may improve the experience of nurse prescribers and enable development and consequently improve patient experience and care delivery. This discussion has also identified a training need for nurses in this role which will be discussed later in the chapter.

5.3 Vignettes and think aloud as methodology

This study was undertaken using qualitative methodology and the use of vignettes, think aloud and semi-structured interviews to explore participants' decision-making processes. This was informed from a review of methods used in NP decision-making literature which identified these methods as valuable in revealing cognitive processes (section 2.5.1). However, a limitation of vignettes applied to complexity was identified and consequently the novel use of staged vignettes in conjunction with think aloud was trialled and used to ensure the breadth of decision-making in response to complexity was captured (section 3.7).

This study has shown the value of the use of vignettes and think aloud methods in the study of the decision-making processes of NPs. The role of these methods in revealing participants' cognitive processes in response to complex scenarios is discussed in detail in Chapter 3 (section 3.3.1). Findings from the study showed that the use of think aloud in response to vignettes allowed study participants to comfortably verbalise their decision-making processes which could not be obtained from observation of practice where the verbalisation of thought processes would be practically difficult and unethical with the patient present. Furthermore, the staging of information in the vignettes enabled understanding of the nature and extent of information collected by participants when exploring complexity and also identified the decision-making processes that were used to determine what information to gather. The additional use of semi-structured interviews allowed explanation and further exploration of these processes to enhance the findings from the vignette responses.

This study supports the constructivist paradigm underpinning this study which allowed for meaning to be constructed and emerge from the study findings whilst acknowledging the influence of my experience of the study area in my researcher role and knowledge of existing decision-making theory.

5.3.1 The novel use of staged vignettes in understanding complex decision-making

A unique and novel aspect of this study was the use of staged vignettes. A weakness identified in existing research into NP decision-making in which vignettes have been used is the absence of a requirement to request on-going information. This has meant that the way in which information that informs decision-making is gathered has not been explored. The use of staged vignettes allowed the sequential process of participants' decision-making to be shown, enabling the think aloud process and revealing the processes that were used to determine the choice of information collected. Of significance was the contribution of staged vignettes to the important findings of this research which showed participants to focus their data collection on the presenting complaint

and the revelation that aspects of the patient's history were not explored, which revealed a dependence on intuitive processes to identify complexity within the vignettes.

However, some limitations were identified in the study methodology and these are discussed in the following section.

5.3.2 Limitations of study methodology

5.3.2.1 Sampling

Purposive sampling was used to recruit participants and was undertaken using methods described in section 3.8.1. However, it was noticeable despite there being no coercion in the recruitment process that there were a high proportion of participants who practised locally and who were known to me through previous professional clinical and educational associations and generally these participants voiced a willingness to help out. Altruism is a powerful motivator in the participation in research (Tappen, 2011) and was perhaps reflected here. However, this had the potential to threaten objectivity where, as the researcher, knowledge of the clinical area and community made me an insider in the research process. Consequently there was a risk of making assumptions regarding the culture and practices of participants and failing to sufficiently probe in the interviews or interrogate the data during data analysis (Asselin, 2003). In order to mitigate against this a reflective diary was kept during the interviews and themes generated during data analysis were reviewed by the supervisory team. These measures are recognised to help minimise researcher bias (Asselin, 2003).

5.3.2.2 Sample size

The initial intention was to recruit twenty to thirty participants however despite measures to promote the research, as detailed in Chapter 3 (section 3.8.1), only fourteen participants were recruited. Despite the reduced number of participants data saturation was achieved in respect of the semi-structured interviews and the think aloud data. Whilst think aloud responses to the vignettes showed differing individual responses, broad themes related to their decision-making could be drawn and data saturation was achieved (Tappen, 2011). Bucknell and Aitken (2010) commented that participant numbers in think aloud studies are often small and as few as six participants due to the quantity and richness of the data generated, however larger sample sizes allow comparison of data across participants and inferences to be drawn as exemplified in the analysis of study data.

5.3.2.3 Vignettes

Some limitations in the use of vignettes were identified in this study.

5.3.2.3.1 Staging of vignettes

The used of staged vignettes has been discussed as being a strength of the study; however the use of pre-written cards to deliver this information revealed some weaknesses in this approach. I was aware during the interview process that the clustering of information on each card e.g. social situation and vital signs (Appendix D) included some information that the participant may not have requested. An example of this was in vignette 4 which, in response to feedback from the pilot study, a blood sugar measurement was included in the vital signs card. It was apparent that this information would not always have been requested and prompted some participants to consider the diabetic status of the patient where otherwise they may not have. Future research using this method could be improved by a more nuanced provision of this information so that only specific information requested by the participant is given.

5.3.2.3.2 Contextual issues

An important finding of the research interviews was the influence of time on the decision-making of participants. However, the think aloud process had no time limit imposed and consequently did not necessarily reflect the pressure of the clinic setting. In reality, this pressure would be difficult to reproduce. First, the process of think aloud is likely to take longer than the corresponding unspoken decision-making undertaken in the practice setting and conversely the process of history taking and physical examination represented on cards is likely to take longer in a real patient consultation. This limitation is difficult to overcome where a requirement to verbalise is necessary to study decision-making processes and would naturally take longer than internalised decision-making, and therefore imposing time limits would not be feasible. However, participants in this study were asked to approach the vignettes as they would in their practice setting and the study findings that showed that they took a problem focused approach to the vignettes which was shown to be representative of pressures of time and indicates that it was unlikely they had significantly altered their approach to decision-making in this study.

5.3.2.3.3 Perceptual factors

Some participants identified the need to see the patient to inform their decision-making and to trigger intuitive processes such as gut reaction. Although participants were presented with written descriptions, and some photographic representations of clinical signs were given where

appropriate it was clear that for some the ability to see the patient would have provided vital additional information to support their decision-making and so the use of intuition or gut reaction may be under-represented in this study. This is a known limitation of vignettes (Benner, Tanner and Chelsa, 1996; Offredy, Kendall and Goodman, 2008; Abuzour, Lewis and Tully, 2018c) and difficult to overcome; however, the use of semi-structured interviews allowed participants to expand on their decision-making processes and explain how they perceived the influence of perceptual factors.

Section 5.2.6 discussed how responding to verbal cues from the patient may reveal their perspective of their presenting illness and provide valuable insight into the management of the patient's complaint which is a limitation of the use of vignettes in this study. Furthermore, it is also possible that the absence of the patient in real terms limited the extent to which participants consider shared decision-making within their consultations which is a key in managing risk (National institute for Health Care and Excellence, 2021) so this too may be under represented in the study findings.

5.3.2.3.4 Construction of vignettes

The construction of vignettes underwent a rigorous process of piloting and clinician review however, reflection on their use in the research process revealed that further modifications would be beneficial. Reviewing the delivery and precision of data presented to participants is recommended to ensure that participants are not inadvertently prompted to consider aspects of the consultation that they would not otherwise address.

The use of four vignettes in the think aloud process produced a vast quantity of complex data which proved extremely challenging to analyse. It was also evident that participants were tiring towards the end of the process. Notably Pirret, Neville and La Grow (2015) used only one vignette and Ritter (2003) two vignettes to explore complex clinical scenarios. Vignette 1 was initially intended to be used as a trial vignette to give participants the opportunity to practice the think aloud process; however, it soon became apparent that the data yielded from this was of such value that it was included in the research findings. Reducing the number of vignettes to three and providing an alternative trial process for think aloud is still likely to provide ample data and similarly allow the opportunity for sufficient variety in the presenting conditions between the vignettes to capture a range of ability. Furthermore, it would help simplify the process of data analysis and be less tiring for participants to complete.

5.3.2.4 Think aloud process

The process of think aloud was generally undertaken with ease by participants although there were times where the knowledge of my clinical background meant that participants initiated clinical conversations with me to debate uncertainties in the presentations. This was managed by focusing them back to the think aloud process.

A limitation of think aloud is incomplete verbalisation of cognitive processes (Ericsson and Simon, 1984). It is possible that the individual variations in participants' ability to vocalise their thoughts may have impacted on the study findings (Ericsson and Simon, 1984). For example, when considering the significance of the varied range of differential diagnoses generated by participants it is possible that some participants incompletely verbalised their decision-making processes. However, this study used concurrent verbalisation which is known to have high validity (Ericsson, 2001) and furthermore the majority of participants were comfortable with the process and were prompted to think aloud if they became quiet and I considered they were not verbalising their thought processes, which would have helped counteract any limitations.

5.3.2.5 Covid 19

Data collection for this study was undertaken before the Covid-19 pandemic which enforced a dramatic change in the delivery of care in general practice in which face to face contact was minimised and remote consultations instigated to prevent transmission of the virus (Turner *et al.*, 2021). Although, face to face contact has increased, as national restrictions have decreased (Turner *et al.*, 2021) anecdotally remote consultations constitute a significant part of NPs workload. This study has focused on face to face consultations with patients and has not investigated telephone or video consultations; however, complex patients are amongst those most likely to necessitate face to face consultations (Royal College of General Practitioners, 2021) and therefore are still being seen and assessed by NPs, thereby endorsing the importance of this research. However, studying the decision-making processes of this same group of prescribers when undertaking remote consultations with complex patients presenting with acute illness is a possible area for future research.

5.4 Contributions to knowledge

This study has enabled valuable insights into the decision-making processes of nurse prescribers in general practice when managing acute presentations in complex patients. It has shown them to

use both intuitive and analytical process to support their decision-making which are dependent on a strong knowledge base and experience and exposure to clinical conditions developed over time. It has been shown that nurse prescriber expertise is demonstrated where intuitive and analytical processes are informed by knowledge, previous experience of and exposure to similar clinical scenarios and is characterised by the use of intuitive processes to interpret guidelines in the context of complex patient factors, morbidities and polypharmacy.

This study is unique in its use of staged vignettes and think aloud applied to complex scenarios and has enabled the identification of a satisficing, problem-focused approach taken by nurse prescribers in the management of complex presentations. This abbreviated approach is not only influenced by the clinical knowledge of participants but is also reflective of the limitations of time restricted appointments.

This study shows that the broad scope of presentations to general practice and the varied training and experience of nurse prescribers means that they have areas of expertise but are inexperienced in others. Nurse prescribers in this study were generally cautious where they lacked confidence in their decision-making and referred to the GP in these situations. Evidence of expertise was identified where participants used intuitive prompts within the consultation to navigate and manage complex factors within the vignettes; however more commonly these factors were overlooked and represented areas of risk for the patient. This raises important questions regarding the clinical development of nurse prescribers and how their unique skills can be used most efficiently in the general practice setting. Moreover, there is an indication that the requirement for nurse prescribers to manage this level of complexity in independent time-limited clinics should be reviewed and a more flexible team-based approach considered.

5.5 Implications for practice

Intuitive decision-making in the form of pattern recognition and intuition developed from knowledge, experience and exposure to similar scenarios has been shown to be enabling for NPs to optimally manage the complex interaction of factors presented in complex vignettes. The wide range of clinical experience and education of NPs in general practice makes it extremely challenging for a single practitioner to possess the range of experience needed to have the confidence to manage the variety and complexity of patient presentations. This raises an important question in respect of how the NP role can best be used in general practice with the recognition of an increased reliance on NPs to counteract the shortage of GPs, notably in deprived areas which have an increased rates of patients with co-morbidities (Nussbaum *et al.*, 2021)

Most study participants reported being allocated patients to their clinics by receptionists, whilst for others this was done using a triage system run by clinicians. Despite measures taken by some participants to ensure that patients were appropriately allocated and within their scope of practice, this was not always successful and resulted in them being faced with patients for whom they did not feel competent to manage. This difficulty of determining the suitability of presentations from patients' initial reports is similarly identified in Hooks and Walker's (2020) exploration of ACP roles in primary care and highlights the need for nurse prescribers in these roles to be aware of the limits of their competence and for support to be available.

Since the Covid-19 pandemic telephone triage and remote consultations have been increasingly used to assess patients; however there is a renewed emphasis on face to face consultations (NHS England and NHS Improvement, 2021) and complex patients are amongst those for whom face to face consultations are clinically indicated (Royal College of General Practitioners, 2021). Although anecdotally it may be the case that telephone triage and remote consultations are increasingly part of the NP workload, face to face clinics are being re-established and complex patients are likely to constitute a significant proportion of patients within these. There is therefore a valid argument that rather than isolating individual practitioners by allocating them a list of time limited appointments, a team approach to managing acute presentations should be considered within general practice which would enable expertise to be directed appropriately and allow the opportunity for sharing knowledge and developing practice. Notably three of the study participants worked in practices that adopted a team approach with nurse prescribers and GPs working alongside each other to manage a shared list without time restricted appointments with the option to select patient presentations for which they felt competent to manage. One of these participants (Participant 12) additionally described how patients were allocated to a team comprising of named GPs and nurse prescribers who took responsibility for their care with the intention of someone from their team seeing them whenever they presented to enable continuity of care.

'Knowing the patient' (section 5.2.2.3) was seen as important in the management of complex presentations by study participants. Both Damarell, Morgan and Tieman (2020) and Stokes *et al.* (2017) found that knowledge of the patient and relational continuity was a key factor in helping to manage the risk associated with patients with multimorbidity and this is reflected in recent policy priorities published by the Royal College of General Practitioners (RCGP) which include a campaign to refocus resources to develop relationship-based care (Royal College of General Practitioners, 2022). Baird *et al.* (2020) discuss the importance of team working in general practice and consider the development of 'microteams', the principle of which is to enable patients to develop ongoing relationships with identified health care professionals. There is

therefore evidence from the literature and from some study participants to suggest that adoption of a team approach to patients presenting with acute presentations to general practice would be beneficial, in particular for complex patients for whom it may take a series of consultations to optimise their care. This approach would allow not only the optimal allocation of skills and thereby potentially achieving better outcomes for patients and relieving clinician stress, but also enable clinicians to identify patients known to them and thereby enabling continuity of care.

Adopting a team approach has implications for patients who may have a preference as to which professional they consult. A study investigating patient preference to consult with a GP or nurse in primary care showed that satisfaction and confidence was lower when they did not consult with clinician they expected; this was particularly evident in those who expressed a wish to see a GP (Paddison *et al.*, 2018). However, a study investigating the impact of nurses working as substitutes for doctors in primary care found an indication that patient satisfaction may be higher for nurse consultations which included patients consulting with urgent complaints (Laurant *et al.*, 2018). There is therefore a need to manage patients' expectations in general practice to ensure that the process of accessing clinicians is clear to patients and that they understand the roles of the clinicians with whom they will consult. Involving patients in the design of such systems may help overcome some of the hesitancy in embracing new ways of working (Paddison *et al.*, 2018) and patient participation groups within GP surgeries are ideally placed to help with this. Furthermore, a team approach for complex patients with a named GP and nurse prescribers responsible for their care would help to address some of these issues.

Kahneman (2011) and Croskerry *et al.* (2017) both discussed the importance of feedback and the opportunity to develop knowledge as key components of expertise. It has already been established that the availability of support and mentorship to study participants was variable and that time restrictions and accessibility of GPs limited this for many. Without the opportunity of mentorship and support it is clear that the majority of study participants will continue to operate within a limited scope of practice necessitating referral to the GP which represents inefficiency and repetition both for clinicians and patients. Furthermore, for those participants working at highly autonomous level who rarely consult the GP, there is the risk that suboptimal care is repeated but not corrected and that they offered limited opportunity for knowledge development. This further supports a move to initiate a team approach to the management of acute presentations in general practice in which appropriate skills can be targeted to optimise care and clinicians are more readily available for support and advice.

5.6 Implications for education

The variation in academic qualifications amongst study participants was noticeable. Only two participants held a full master's qualification in Advanced Clinical Practice and one in First Contact Care whilst other participants had completed a range of CPD modules in addition to their prescribing qualification (section 4.2.4.) A recent document published by Health Education England (2021), endorsed by key institutions such as the Royal College of General Practitioners (RCGP) and the Royal College of Nursing (RCN), sets out a new career and capability framework for general practice nurses. This was written in recognition of the increasing and complex needs of general practice populations and the need to ensure that nurses deliver safe and effective care. Importantly it identifies six career levels and specifies the characteristics of each level whilst recognising that an individual's role may extend beyond a single level. This overlap is shown in Figure 19 below.

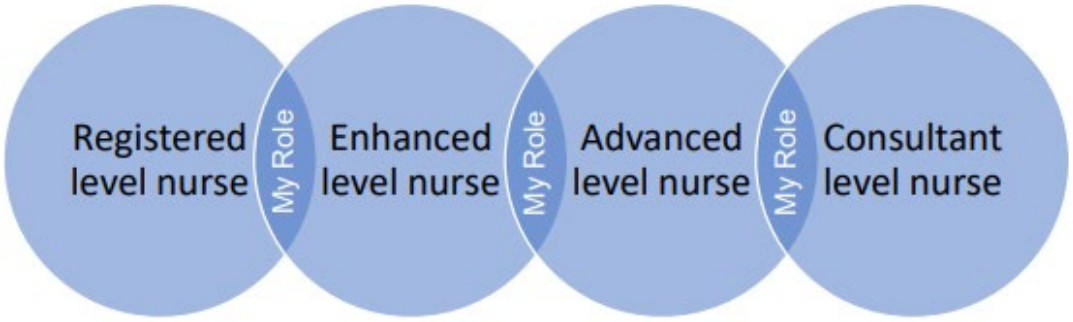


Figure 19 Career framework for general practice nurses (Health Education England, 2021)

The key feature of advanced level nurses is identified as the ability to combine clinical skills with research, education and leadership thus showing competence in all four pillars of advanced practice (Health Education England, 2017). Additionally, only those with a full master's in advanced clinical practice (ACP) or validated portfolio equivalent are recognised within the advanced level nurse category whilst those at an enhanced level are expected to have an independent prescribing qualification and modules appropriate to their scope of practice. This framework applied to study participants show the majority to fit in the overlap between enhanced and advanced level practice with their roles having high clinical focus and, as such, although the lack of regulation regarding job titles is acknowledged, most would identify as Nurse Practitioners rather that Advanced Nurse Practitioners. This framework, perhaps for the first time, provides some clarity in its recognition of those nurses who wish to stay working with a clinical

focus and do not necessarily want to develop all four pillars of advanced practice and progress into the advanced practice role.

Although core capabilities are detailed for different levels of practice, there is no jurisdiction in the Health Education England (2021) document of what constitutes the appropriate continuing professional development (CPD) modules required by enhanced level nurses other than the specification that they should be aligned to the individual's scope of practice. The majority of study participants had studied a range of CPD modules including diagnostic decision making and history taking and physical assessment modules or completed a nurse practitioner undergraduate degree in addition to their prescribing qualification but there was considerable variation. The inconsistency in training requirements for nurse prescribers undertaking medical aspects of their roles such as diagnosis and prescribing in general practice is in contrast to GP trainees who are already qualified prescribers and undertake an additional three year training period which includes experience in general practice overseen by a GP trainer, rotation to hospital specialities and a rigorous system of examination (Health Education England, 2022).

A more formalised training for nurses going into these roles with a similar standardised educational pathway and rotation to other clinical areas and mentorship to develop the exposure and experience required to manage the complexity of presentations to general practice has potential not only to enhance the performance and confidence of nurse prescribers but also to improve efficiency and patient satisfaction. Whilst some medical colleges such as the Faculty of Intensive Care Medicine (FICM) and the Royal College of Emergence Care Medicine (RCEM) have established curriculums which advanced clinical practitioners are required to complete in order to practice under this title (Faculty of Intensive Care Medicine, 2022; Royal College of Emergency Medicine, 2022), an equivalent mandatory process has yet to be established by the Royal College of General Practitioners (RCGP). Moreover, regulation of advanced practice roles by the NMC is yet to be agreed but an initial scoping review is due to be completed by 2023 (Nursing and Midwifery Council, 2022). Without regulation of the role of the advanced nurse practitioner or a mandatory requirement to complete a formal curriculum by the RCGP it is unlikely that standardised training for general practice nurses in this role will be achieved in a climate of high patient demand and restricted finances. However, findings from this study showed that a team approach to acute presentations has potential to increase the opportunities for support and development from GPs and adoption of this model may facilitate mentorship for these nurses.

This study has shown the importance of nurse prescribers' understanding and self-awareness of their decision-making processes both in diagnosis and prescribing decision-making and this should be considered equally as important as clinical experience, exposure and mentorship. Although

non-medical prescribing competencies stipulate a high level of diagnostic and prescribing decision-making there is currently no requirement to undertake a dedicated diagnostic or clinical reasoning module (Royal Pharmaceutical Society, 2021). Some Higher Education Institutions demand completion of such modules prior to being accepted on to the non-medical prescribing (NMP) programme but this is not universal. It is therefore imperative that HEIs incorporate clinical reasoning into their NMP programmes.

There is also evidence that a more systematic approach to history taking is needed in complex presentations to decrease the reliance on intuitive processes to identify complex factors and to ensure issues such as medication adherence are routinely explored. Furthermore, the use of consultation models may be beneficial in providing a framework and protecting against omissions. This suggest that dedicated teaching on approaches to complex presentations should be a priority for the NMP curriculum.

Finally, the use of staged vignettes and think aloud has potential to provide a valuable teaching aid in the management of complex prescribing scenarios. The requirement to request information has been shown to reveal an individual's decision-making processes and identify areas that need development. Notably a reliance on intuitive processes was shown in the gathering of information which represented risk in complex scenarios. Staged vignettes have potential to be used as a teaching tool, highlighting the need for a more comprehensive approach to history taking and an analytical resource-based approach to the generation of differential diagnoses for this group of patients. These vignettes could be used in small teaching groups or mentorship sessions and allow unique insights and feedback that may not be gained through traditional feedback or retrospective reflection.

5.7 Reflection on the research process

Olmos-Vega *et al.* (2022) consider reflexivity as a process in which the researcher critically considers the influence of their subjectivity and the context of the research on the research process. Subjective interpretation is integral to the constructivist approach taken in this research and whilst the perspective and assumptions of the researcher can provide valuable insights, this can also result in error (Hammersley, 1992). As a clinician with experience as an ANP in general practice and a university lecturer teaching on the advanced clinical practice programme I was aware that my own experience and perspective of the research topic would inform the interpretation of the data (Flick, 1998). This, whilst enabling valuable insights that might not otherwise be gained, risked objectivity and I needed to resist the temptation to focus on themes

that were familiar or with which I agreed and attended equally to contrary or new themes. In order to counteract this, I kept a reflective diary (section 3.10) whilst undertaking the interviews and data analysis. This method is well recognised in the literature as increasing trustworthiness in qualitative research (Tappen, 2011)..

Olmos-Vega *et al.* (2022) discuss the power dynamic between the researcher and interviewer with the researcher being seen to judge the validity of the information from the research process. Many of the participants were known to me through past and current professional connections and it was noticeable that those less confident needed reassurance that this was not a test of their ability but rather to explore their decision-making processes.

There were occasions when participants asked my view or wanted to engage in a professional debate about the best treatment, but I resisted this as much as possible and refocused them back on the think aloud process. Overall participants soon understood the process and soon became confident requesting information in the think aloud process. The interview process was more straight forward with participants keen to share their views and whilst knowledge of the subject area was useful, I needed to be cautious not to use my personal views to direct the discussion but to ensure that it was led by the participant (Gerrish and Lathlean, 2015).

The process of data analysis was undertaken by only one researcher and this process alongside the interpretation of data was at risk of being influenced by my professional background and training. I was aware that at times an individual participant expressed a view that I recognised or felt strongly about, and it was easy to attribute greater importance to this than was represented in the data; consequently I was careful to be aware of this tendency and to ensure I referred back to the data to confirm findings. In addition to keeping a reflective record of the process themes were discussed and debated with the supervisory team and thus increased the dependability of results (Lincoln and Guba, 1985).

5.8 Recommendations for future research

The research methodology of staged vignettes, think aloud and semi-structured interviews has shown to be valuable in exploring the decision-making processes of nurse prescribers in the assessment of complex scenarios and has given useful and new insights into the challenges faced by this group of prescribers when faced with complexity. However, this research was undertaken on a small sample of nurse prescribers who had a wide range of qualifications and experience so further research that explores and differentiates novice and expert nurse prescriber decision-making processes would be of benefit.

The study yielded a large volume of diverse data that was challenging to analyse so some adaptions to the research process are recommended. The use of fewer staged vignettes and refining the process of delivering requested information to ensure it does not exceed that which is asked for is recommended.

Finally, data collection for this study took place before the Covid 19 pandemic. Since then, working practices in GPs have changed and anecdotally nurse prescribers are undertaking more remote assessments via telephone and video. Further research exploring the decision-making undertaken during these assessments would be beneficial in understanding the processes underpinning these decisions in complex presentations in particular their decisions to initiate a face-to-face consultation or to manage the consultation remotely.

5.9 Summary and conclusion

The aim of this study was to investigate the decision-making processes of nurse prescribers in general practice when managing acute episode of illness in complex patients and explore how these nurses justify and explain their decision-making. A novel methodology was piloted and introduced using staged vignettes, think aloud and semi-structured interviews. Fourteen NPs working in primary care undertook think aloud in response to vignettes and were interviewed and valuable insights into their decision-making processes in the context of complex scenarios was gained and recommendations for practice and education made.

The findings showed that overall NPs were cautious in their decision-making and readily referred situations to the GP which they considered outside of their scope of practice. There was variation between and within participants in their abilities to complete the scenarios which revealed pockets of expertise reflecting the individual's knowledge, experience and exposure to similar scenarios.

Analysis of decision-making processes showed participants to use both analytical and intuitive processes in their responses to vignettes and although intuitive processes were identified as necessary to complete some complex decision-making within the vignettes by some experienced participants, their use was also associated with risk which was exemplified by participants' reliance on intuitive processes to identify complex features of the vignettes.

Time limited appointments were influential on the content of the assessment and resulted in participants take a problem-focused, satisficing approach to the consultation and additionally limited the opportunities for participants to develop their knowledge. For some participants

personal characteristics resulted in them managing these limitations by adopting a heightened level of autonomy that represented an efficiency that may not always have represented the optimal outcome for the patient.

A team approach to the management of acutely presenting complex patients is recommended. This would allow the sharing of skills, enable clinician development thus overcoming the risk and stress associated with time limited appointments. Furthermore, allocating complex patients to a team of clinicians would improve continuity care, maximise the benefit of clinician's pre-existing knowledge of the patient and potentially improve outcomes for patients. Finally, those responsible for the development of NIPs in primary care should ensure they have received appropriate training in clinical decision-making and are allowed ready access to support to enable their development.

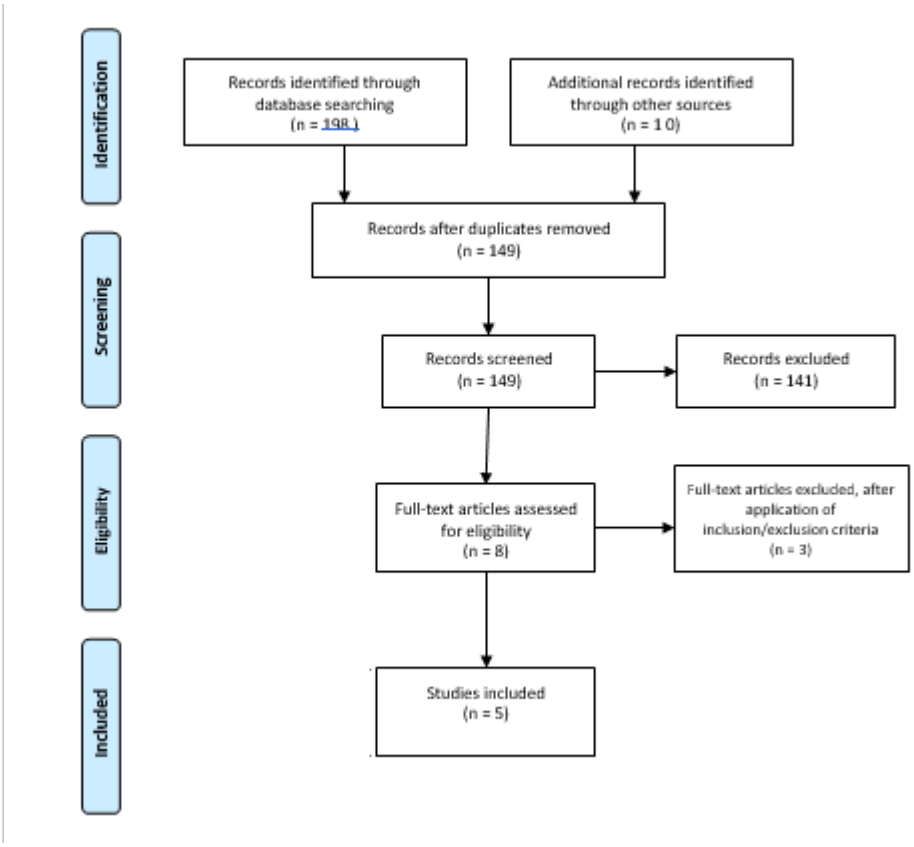
The novel use of staged vignettes in this study has enabled unique insights into the decision-making processes of NIPs in general practice when managing acute presentations in complex patients. The use of this method has revealed NIPs to rely on intuitive prompts to identify complex factors within acute presentations in patients with multimorbidity and polypharmacy. Intuitive processes used in this context, which are dependent on individual knowledge and experience, have been shown to be unreliable and can result in important aspects of the patient presentation being overlooked, and consequently represents an area of risk in the management of this patient group. Whilst findings from this study have shown NIPs to demonstrate areas of expertise in the management complex patients, caution is needed to ensure that their expertise is appropriately targeted, and support is readily available for these practitioners.

Appendix A Search process: influences on decision making

A.1 Inclusion and exclusion criteria: influences

Inclusion	Exclusion
Nurse prescribers	Other nursing roles or studies relating to other professions where findings related to nurse prescribers cannot be clearly distinguished.
Related to influences on the decision-making of nurse prescribers	Studies relating to influences on factors not related to decision making.
Research	Non -research articles.

A.2 PRISMA flowchart to show search strategy for influences on decision-making



Appendix B Summary tables

B.1 Summary table of data extraction: decision-making processes

	Participants and setting	Design and methods	Key findings	Comments/ limitations
Abuzour et al (2017) A qualitative study exploring how pharmacist and nurse independent prescribers make clinical decisions	UK Secondary care. 11 NIPs 10 pharmacy independent prescribers (PIPs)	Qualitative 3 vignettes, think aloud, semi-structured interviews. Participants could select vignettes that represented clinical areas in which they had competence. Data analysis: Constant comparative approach Information processing theory (IPT) used for data interpretation. Data saturation achieved.	Clinical knowledge and experience informed clinical reasoning. A five-stage model was presented. NIPs more likely to undertake a physical examination than PIPs. Prescribing decision was a separate stage. Process of reaching decision was not autonomous. MDT used to reach final decision. Case referred to other member of MDT based on competence and confidence, familiarity with presentation, usual prescribing practice and severity of condition.	Secondary care setting limits transferability. Use of basic, single stage vignette for ease of verbalisation. Complexity not specifically addressed.
Burman et al (2002) How do NPs make clinical decisions?	US 36 primary care nurse practitioners. Rural and urban settings.	Qualitative. Grounded theory. Face to face or phone interviews. 2 vignettes (acute and chronic).	Two processes – diagnostic reasoning and care planning. Pattern recognition primary theme	Explanation rather than think aloud may not accurately represent decision-

	Varied educational qualifications	Participants asked to explain their decision-making process and influences in response to vignettes. Data analysis: Ongoing comparative analysis, thematic. IPT and intuitive model.	in making a diagnosis. This included use of schemas, intuition and hypothesis testing. Holistic approach to care planning. Referred to other clinicians when in doubt. **Influences:** experience, scope of practice, knowledge of patient, common presentations in the community, knowledge of community's health seeking behaviours, organisational factors.	making processes. Not prescribing focused. US study varied settings. Complexity not specifically addressed.
Marsden (1999) Expert nurse decision-making: Telephone triage in an ophthalmic accident and emergency department	UK. Single site . 7 Nurse Practitioners.	Semi-structured interviews following telephone triage consultation. Iterative, cyclical thematic analysis. Hypothetico-deductive model and intuition informing data analysis.	Expert nurses use a framework of hypothesis testing. Inexperienced used guidelines. All referred to gut feeling at times overriding decision-making. Influences: guidelines for inexperienced NPs.	Small study, single site, telephone triage. No prescribing decision-making. Limited transferability. Explanation rather than think aloud may not accurately represent decision-making processes.
Offredy (1998) The application of decision-making concepts by nurse practitioners in general practice	UK. 20 nurse practitioners. Primary care. Range of educational qualifications.	Semi-structured interviews. Observations of consultation. Qualitative content analysis.	Hypothetic-deductive reasoning used by both experienced and less experienced NPs .	Older study undertaken whilst NP and prescribing role developing. Retrospective reports of

		Application of hypothetico-deductive, decision analysis, pattern recognition and intuition.	Expert NPs used more pattern recognition and intuition. Inexperienced used hypothesis generation. More experienced NPs had shorter consultations, early hypothesis generation and flexible approach. Holistic consultations including social factors and contextual considerations requiring longer appointments Uncertain or complex problems IPT applied.	decision-making strengthened by observation.
Offredy (2002) Decision-making in primary care: outcomes from a study using patient scenarios	UK . Primary care. 12 Nurse practitioners 12 GPs.	6 scenarios, think aloud. Participants given scenario with patient demographic and chief complaint and then asked to request information. IPT and Marshall's schema theory for data interpretation. Reference model to assess response to scenarios.	GPs and NPs use similar decision-making processes. Two types of decision-making: diagnostic and treatment. Nine stages identified. GPs able to chunk larger pieces of information – represents greater knowledge base than NPs – pattern recognition. GPs accessed less cues – may represent differences in decision-making training between GPs and NPs.	Participants had undertaken RCN NP degree but not necessarily prescribers. Delivery of requested information in vignettes not specified other than a photo if the patient was to be examined.

			NPs refer to GPs when outside of role or when uncertain about diagnosis or treatment Extensive clinical experience is needed to develop schema.	
Offredy et al (2008) **The use of cognitive continuum theory and patient scenarios to explore nurse prescribers' pharmacological knowledge and decision-making**	UK. 25 NIPs including 7 prescribing students.	Feasibility study to tests the use of patient scenarios to determine why nurses make prescribing decisions. 4 patient scenarios (single stage) and think aloud. Semi-structured interviews to determine how decisions were made. Data from scenarios matched to scoring scheme to assess accuracy of responses. Participants asked to rate their knowledge and confidence regarding medication used in their clinical areas. Content analysis to rate response and match against Hammond's cognitive continuum to identify type of cognition Descriptive statistics and qualitative comments to show number of issues identified in the scenario, the acceptability/correctness of response and confidence in prescribing knowledge.	Both analytical and intuitive decision-making. Most commonly used modes were peer-aided judgement and intuitive judgment. Consult GP where outside of competence Use of intuitive thought resulted in incorrect decisions and it is concluded that intuition cannot be relied on for nurse prescribing. **Influences** Pharmacological knowledge, increase responsibilities of prescribing, social and institutional support and scope of practice stipulated by employer and professional body affect confidence to prescribe	Data collection pre 2006 extension to prescribing formulary Participants were not given access to usual resources eg BNF or were given scenarios that they would not usually encounter so not representative of actual clinical practice.
Pirret et al (2015) **Nurse practitioners versus doctors**	30 Nurse Practitioners 16 Doctors. New Zealand tertiary care –	Comparative research design – mixed methods. Single complex case scenario and think aloud	Nurse practitioners identified fewer differential diagnoses	Single case study. Not required to request information.

diagnostic reasoning in a complex case presentation to an acute tertiary hospital: A comparative study	multiple specialties (part of a wider study) NZ nurse practitioners Master's degree, prescribers, practice independently	Information presented in segments via computer programme. Participants were asked to think aloud. They could choose the order and rate each segment presented. Participants were asked to give summary of plan at the end. Transcription coding and categorized Quantitative data analysyed using coding scheme described by Elstein *et al.* (1993) analysis. SPSS used for data analysis. IPT informing data analysis	More NPs conferred with a consultant colleague than MDs and ordered fewer investigations. NPs who completed the scenario in the shortest time had the poorest diagnostic reasoning abilities. This may reflect the use of intuitive processing with premature closure where the complexity of the case required analytical processing NPs cognitive abilities compare favourably to doctors. **Influences:** Increased experience improves accuracy of NPs diagnostic skills Participants who took longer to complete the scenario were more accurate	Authors recommend further research using multiple complex case studies. Prescribing decision-making not explored.
Pirret (2016) Nurse practitioners versus physicians' diagnostic reasoning style and use of maxims: A comparative study	30 Nurse Practitioners 16 Doctors New Zealand tertiary care – multiple specialties (part of a wider study) NZ nurse practitioners Master's	Quantitative. Comparative research design. Intuitive/analytical reasoning instrument. Maxims questionnaire SPSS for statistical analysis. Dual processing theory.	NPs used more System 1 processes than MDs. Both NPs and MDs similarly identified with commonly used maxims. Use of maxims was not related to their	Underpowered at risk of Type II error. Lack of statistical significance. Self-reported, retrospective reflection of decision-making processes

	degree, prescribers, practice independently		diagnostic reasoning abilities and therefore it is concluded that System 2 processes were appropriately triggered.	System 2 favoured by MDs may reflect training – doctors taught analytical approach through formal training, possible acquired later by NPs.
Ritter (2003) An analysis of expert nurse practitioners' diagnostic reasoning	US. Setting not stated. 10 expert Nurse Practitioners (minimum 3 years' experience as NP, Master's degree, licensure as NP, clinical leadership role or lecturer).	Qualitative. 2 common complex case studies, think aloud verbalisation whilst making a patient diagnosis. Single stage. Semi-structured interviews, content analysis. Coding for components of IPT and Hermeneutical model.	Both models used – overlap and blend. Gathering data (IP) and skilled know-how (the processing of simultaneously processing multiple complex variables in an automatic manner) (HM) account for over 50% of themes. Diagnostic reasoning begins with a process of cue gathering (IP) then using skilled know-how (HM) and other aspects of the HM to inform further fact gathering to formulate a diagnosis. Model needed to reflect both of these processes. Tendency to focus on IPT.	Complex case scenarios used. Small study, 2003 Prescribing decision-making not explored.
Rosciano et al (2016) Nurse Practitioners' use of Intuition	US New York state. 123 Nurse practitioner in primary and	Quantitative. On-line survey. Smith's intuition instrument. Statistical analysis SPSS.	100% use of intuition. Feelings of reassurance	Application to the decision-making process is not explored.

	secondary care. Nurse practitioners: Masters level education, prescribe within area of speciality	Intuitive-humanistic model underpinning analysis.	most commonly experienced. Intuition is incorporated into clinical reasoning and decision-making.	Self-reported, retrospective reflection on the use of intuition.
Thompson et al (2017) **A comparative study on the clinical decision-making processes of nurse practitioners vs medical doctors using scenarios in a secondary care environment**	Secondary care. South England district general hospita.l Nurse practitioners – not necessarily prescribers.	Qualitative. Think aloud scenarios - open ended questions – participants allowed to ask as many questions as needed. Semi-structured interviews. Data analysis: Reference model Protocol analysis – data coded in 9 stages of cognitive processes under major themes of diagnostic and therapeutic Thematic analysis of interviews IPT and Marshalls schema theory	NPs and doctors had similar models for decision-making processes. Doctors had shorter consultations and different styles of acquiring information. NPs acquired more cues than MDs in history taking and took longer although more experienced NPs were similar to MDs. NPs and MDs similar in terms of correct diagnoses and therapeutic treatments **Influences:** Clinical experience Exposure to a variety of conditions	Small sample in area of specialty in secondary care.

B.2 Summary table of data extraction: influences on decision-making

Author and title	Participants and setting	Design and methods	Key findings	Comments/limitations
Abuzour et al (2018) Factors influencing secondary care pharmacist and nurse independent prescribers' clinical reasoning: An interprofessional analysis	UK. Secondary care 11 NIPs 10 PIPs	Qualitative. 3 vignettes, think aloud, semi-structured interviews Data analysis: constant comparative approach.	Three main themes: Intrinsic factors eg knowledge and skills, Contextual eg availability of resources Sociocultural eg Interactions with others.	Secondary care setting Includes NIPs and PIPs. Differentiates findings for NIPs where relevant Complexity found to challenge competence and suggests complex cases are less likely to be completed autonomously.
Djerbib (2018) A qualitative systematic review of the factors that influence prescribing decisions by independent nurse prescribers in primary care	Inclusion criteria: Nurse prescribers in UK primary care post 1994.	Systematic review 10 papers included Comprehensive transparent search strategy Quality appraisal using recognized tool Meta-ethnography to underpin data analysis All papers used interviews for data collection	Three main themes perception of competence, perception of risk and impact on patient. NIPs reluctant to prescribe for patients with complex medical problems or polypharmacy (2 papers)	Single reviewer Not all studies focused on influences on prescribing decision-making Includes Offredy (2008) but does not explore the decision-making processes aspect of the paper
McIntosh et al (2016) Influences on prescribing decision-making among non-medical prescribers in the United Kingdom: systematic review	UK. Inclusion criteria: NMP studies researching prescribing decision-making in primary and secondary care: 2003-2013	Systematic review 3 qualitative papers all primary care setting Transparent search strategy Quality assessment and data extraction undertaken by 2 researchers Due to small number of papers none excluded due to quality.	Influences: Evidence based guidelines, BNF Experience prioritised over evidence-based guidelines where concern regarding complications or clinical uncertainty Exposure to patients increased confidence Peer and organizational support	Two papers focus on antibiotic prescribing and one of these children only, Includes Offredy (2008) but does not explore the decision-making processes aspect of the paper

		Narrative synthesis		
Ness et al (2016) Influences on nurse prescribers' antimicrobial prescribing behaviour: a systematic review	Inclusion criteria: studies that included nurse independent prescribers and antimicrobial prescribing.	Systematic review. 7 papers included: 1 UK, 5 USA, 1 Lesotho 6 quantitative, 1 qualitative Comprehensive, transparent search strategy Quality appraisal undertaken by 2 reviewers independently Narrative synthesis Heterogeneity of methods used meant meta-analysis could not be performed.	Different findings depending on focus of paper: Whether to prescribe antibiotics: national guidelines, patient clinical presentation, non-medical patient factors eg parent pressure, peer support, US studies – cost, race Which antibiotics to prescribe – characteristics of the drug, previous experience in using the drug.	Many limitations of the quality of the individual studies identified. Most used surveys which relied on self-reported data. Only one qualitative study UK based -scheduled and unscheduled care but limited to antibiotic prescribing and complexity not specifically addressed. Limitation of methods within the studies means recommendations could not be made.
Williams et al (2017) General practitioner and nurse prescriber experiences of prescribing antibiotics for respiratory tract infection in UP primary care out of hours	UK. 15 GPs and 15 nurse prescribers. Rural and urban out of hours.	Qualitative. Semi-structured interviews. Inductive thematic analysis	Influences on NPs: Audit, feedback and supervision influence future prescribing decisions. Patient anxiety, clinical condition and inability to follow up increased likelihood of prescribing antibiotics. Patient awareness and	Some findings specific to out of hours setting which limits transferability.

			understanding of their condition influenced decision-making. NPs used guidelines and evidence to justify their decision-making. NPs considered GPs should see more complex cases. GPs more likely to make prescribing decisions made on gut feeling.	

Appendix C Interview schedule

Semi-structured interview schedule: Version 2 14/10/18

This interview will follow straight on from the think aloud interview.

The consent form will have already been discussed and signed.

Participants will be informed that the interview is likely to take between 30-60 minutes

1. Ask participant for additional clarification from think aloud

Prompts:

Which aspects did you feel confident in? Were there any particular issues within the vignettes that you found difficult?

Can you elaborate on how you reached these decisions?

On reflection was there any aspect you feel you could have explored further?

2. Having completed the vignettes can you tell me a bit more about your decision-making when prescribing for acute presentations for patients with comorbidities and polypharmacy?

Prompts:

How do you normally make such decisions? What are the processes involved?

How difficult do you find these decisions? If difficult, why is that?

Are there particular situations/presentations conditions that you feel more comfortable managing?

Why is this?

Can you identify how you have developed these skills? Training, peer support (GP, NIP) , environment, prescribing culture

Are there aspects you find particularly challenging? If so what are these?

What resources do you use?

Do you have any rules of thumb/short cuts you can identify?

How confident do you feel in managing these consultations independently?

4. How often do you manage these kind of presentations independently?

Prompts:

Seek advice, refer on, avoid?

5. What resources do you find most useful in managing these kind of presentations?

Prompts:

On-line resources, colleagues eg GP/pharmacists

6. How well do you feel your prescribing training has equipped you to manage this group of patients?

Prompts:

What particular aspects of training? Pharmacology lectures, DMP supervision?

What additional training support have you received?

What additional support would you find or have you found beneficial?

7. Can you tell me about your qualifications and clinical experience? Please do not identify organisations by name.

Prompts:

Educational qualifications, clinical experience (organisations, length of time)

Appendix D Vignettes

Vignette 1

Instructions:

You will be presented with a card containing a patient's presenting complaint and background information that you may expect to find on the summary page of the patients' notes.

You will be asked to think aloud your thoughts as you look at this information and consider you next steps.

You will then be required to request any further information you need, in a process resembling an actual patient consultation. You will need to keep requesting the information you need to arrive at a diagnosis and treatment plan.

You may refer to the BNF or on-line resources as you would normally during a consultation.

You will have an opportunity to try this out with a practice case.

CARD 1

Initial information
73 year old male
Skin rash

CARD 2
Computer summary

PMH:
Hypertension
Type 2 diabetes
Asthma

Medication:
Amlodipine 10mg
Metformin 500mg TDS
Glipizide 5mg OD
Salbutamol inhaler PRN
Clenil 100 micrograms 2 puffs BD

Allergies:
None known

Never smoked

CARD 3

History of current complaint

Onset of pain to right side of chest 1 week ago
Spots have come up on the right side of his chest in the last few days.
Painful.
No change to washing powders, products, no new medications.
Feels well in himself
Difficult to sleep.
Has applied camomile lotion.
Has taken paracetamol, minimal relief

CARD 4

General survey

Attends alone.
Looks well, well perfused, no apparent distress
Unkempt appearance, clothes loose and not washed

CARD 5

Adherence

Has not ordered medication for last 3 months although says he is taking them regularly

CARD 6

Social history

Lives alone. No support.
Has a son who lives in Newcastle.

CARD 7

Vital signs

T 37
Pulse 76 regular
BP 180/90
RR 16
Sats 96%
BM 18 mmols

CARD 8

Physical examination

Alert and orientated

Several clusters of vesicles to right side of chest T6-8 dermatome distribution, extending to back.

Do not appear infected.

No other rash.

CARD 9

CARD 10

OTC medication

Taking paracetamol one tablet daily

Takes occasional ibuprofen

CARD 11

Immunisations

Primary immunisations complete

Influenza 10/19

Pneumoccal (PPV) 2013

CARD 12

Blood results

No recent results

Last HbA1c 2 years ago: 7.5

CARD 13

Pain

Stabbing, prickling, burning pain, constant, affecting sleep

6/10 pain score

CARD 14 **Diabetes** No record of diabetes in last 2 years Last HbA1c 7.5 2 years ago
CARD 15 **Asthma** No record of asthma review in last 2 years Never uses inhaler Rarely bothered by shortness of breath No cough
Considers: *Likely shingles* *Antiviral treatment – can start up to 1 week after onset* *Choice of antiviral – frequency - adherence* *Analgesia – optimise paracetamol, avoid ibuprofen. Could consider codeine, will need following up* *Stop calamine lotion* *Hypertension and diabetes control: ? adherence. Needs blood tests and monitoring.* *Issues of self-neglect, support at home, adherence, cognition*

VIGNETTE 2

Right hand column represents the staged information within the vignette, italics represent key points which may be considered by the clinician

Participant will be presented with Card 1 and then will be required to ask for additional information as they feel is indicated and presented with the appropriate card

CARD 1 **Initial Information** 86 year old male Foot swelling	
CARD 2 **Computer summary**	

PMH: Hypertension COPD Aortic valve replacement (2010) Dementia: mild Depression GORD **Medication:** Warfarin Mirtazapine 15mg ON Atorvastatin 20mg OD Bendroflumethiazide OD Omeprazole 20mg OD Salbutamol inhaler PRN Spiriva 18 micrograms OD **Allergies**: None known **Ex-smoker**	***Key points*** ***Differential diagnoses:*** *Traumatic* *Cellulitis, gout (bendroflumethiazide), septic arthritis* *Heart failure* • *Notes **warfarin*** • *Thinks about cognition and medicine adherence* *Thinks about social history and function*
CARD 3 **General survey** Alert. Looks well. Attends alone Tidily dressed. Walks with a limp. Appears unsteady.	
CARD 4 **History of current complaint** Onset 24 hours ago of red swollen right foot. Painful, has worsened. Describes 8-9/10 on pain scale. Can't recall injuring himself. Feels well. Pain killers have not helped. No previous episodes. No other joint swelling.	*Starts to narrow diagnosis with absence of hx trauma* *Start to consider analgesia – interactions NSAIDs: warfarin* *Considers cognition, social history*
CARD 5 **Adherence** Wife manages medications	*Notes importance for prescribing decisions, wife is not present at this consultation*
CARD 6	

Social History Lives with wife who is fit and well. Wife drives Alcohol: a couple large whiskies each night	*Notes social history – impact on prescribing decisions* *Alcohol – falls risk, mirtazapine interaction, warfarin, gout*
CARD 7 **Vital signs** T 36.8 Pulse 70 regular RR 20 BP 120/70 O2 Sats 96%	*Notes normal observations* *Absence of pyrexia*
CARD 8 **Physical examination** Right foot: Skin intact, red and swollen MCPJ big toe, no other redness or swelling to foot or lower limb. Tender on palpation and restricted range of movement, hot to touch. Normal sensation to foot, pulses intact.	*No SOB, skin intact, localised swelling only – narrow DD* *Typical of gout presentation*
CARD 9 	
CARD 10 **OTC meds** Has been taking regular paracetamol and occasional ibuprofen. Last took paracetamol 3 hours ago	*Identifies Ibuprofen risk and warfarin* *Acknowledges renal function, recent inr*
CARD 11 **Mobility**	

Walks with a limp. Unsteady gait. Wife dropped him at the surgery Usually manages stairs at home, had to come down stairs on his bottom today. No history of falls but has had a few near misses.	*Considers mobility/safety/walking aids/community team input*
CARD 12 **Recent blood tests** eGFR 46 (6 months ago) INR 2.1 (1 week ago)	*Considers repeating eGFR*
CARD 13 **Warfarin + NSAID** Increased risk of bleeding events Manufacturer advises caution of avoid	
CARD 14 **Colchicine + atorvastatin** Increased risk of rhabdomyolysis	
Card 15 **Prednisolone + warfarin** Increase effects of warfarin. Manufacturer advises monitor effects of inr	

Prescribing points *Considers warfarin* *Stops OTC ibuprofen* *Considers stopping/changing bendroflumethiazide* *Considers analgesia options:* *NSAIDs contraindicated – warfarin* *Colchicine : recognises narrow therapeutic window, diarrhoea. Reduced dose (eGFR) Caution with statin.* *Prednisolone –GI (on omeprazole) interaction with warfarin (moderate)* *May consider codeine – side effects : drowsy, falls risk , constipation*

Additional considerations *Instructions (cognition). Wife manages medicines – not present at consultation* *Alcohol - falls risk , mirtazapine, warfarin, gout* *Safety netting/ review* *May consider measuring uric acid 4-6 weeks after acute episode*

VIGNETTE 3

Right hand column represents the staged information within the vignette, italics represent key points which may be considered by the clinician

Participant will be presented with Card 1 and then will be required to ask for additional information as they feel is indicated and presented with the appropriate card

CARD 1 **Initial information** 83 year old male Shortness of breath	***Key points***
CARD 2 **Computer summary** **PMH** Hypertension MI Atrial fibrillation	***Differential diagnoses:*** *COPD exacerbation* *Decompensated heart failure* *IHD* *Uncontrolled AF* *Acute URTI, LRTI*

CKD 3 COPD: Moderate Heart failure: LVSD: Moderate/severe **Medication:** Bisoprolol 2.5mg OD Ramipril 1.25 mg OD Apixaban 5mg BD Atorvastatin 80mg OD Amlodipine 5mg OD Bumetanide 2mg OD Salbutamol inhaler 2 puffs PRN Seretide 500 BD Spironolactone 25mg OD **Allergies:** None known **Ex-smoker**	*PE* *Lung pathology/cancer* *Anaemia* • *Notes diuretic* • *Considers seretide – notes risk of pneum and considers review* *Considers adherence , social situation, cognition* *OTC meds*
CARD 3 **General survey** With wife Alert, breathless walking into the room but settles at rest. Well perfused. Talks in full sentences	
CARD 4 **History of current complaint** Has been feeling more breathless over the week, especially on exertion. Has worsened Had a cold a couple of weeks ago and has a bit of a cough Afebrile Has been feeling more tired. Has tried using inhaler not helped much	*Starts to narrow diagnosis:* *Considers COPD exacerbation, notes inhaler not helping, considers other causes, requests more information*
CARD 3 **Additional history** No colour change or increase of sputum Worse at night when lies down Using 3 pillows (usually 2) Inhaler hasn't helped much No chest pains Ankles are more swollen	*Unlikely respiratory, considers heart failure* *Notes amlodipine and ankle swelling* *Requests background on heart failure managem*

CARD 4 **Adherence** Manages own medication Says he takes all medication as prescribed but mentions doesn't take bumetanide when going out and only takes one normally	*Consider impact on diagnosis, considers how often he goes out*
CARD 5 **Social history** Lives with wife who is well Active member of local church Mobile with stick Alcohol 1-2 units daily	*Notes active and implications for diuretics* *Considers impact of alcohol, mobility, falls risk*
CARD 6 **Vital signs** T 36.2 P 98 irreg RR 26 Sats 93% BP 100/50	*Thinks about baseline obs*
CARD 7 **Baseline observations** P 88 irreg Sats 95% BP 105/80 RR 24	*Notes relative tachycardia and tachypnoea and reduction in sats*
Card 8 **Physical examination** Chest: equal expansion, resonant, fine crackles to both lung bases Pitting oedema to mid-calf, right and left	*Links to heart failure* *Considers weight, JVP*
Card 9 **OTC meds** Nil	
Card 10 **Additional examination** Weight 80 kg (+3kg) JVP +4cm	
Card 11 **Blood results**	

Last done 3/12 ago Stable FBC within normal range eGFR 41 Creatinine 129 Na 133	*Notes eGFR, recognises need for baseline blood prior to titrating diuretics*
Card 12 **Clinic letter from Heart Failure Team** Seen 3 months ago Diagnoses: MI 1993 Moderate /Severe LVSD Atrial fibrillation Current meds: Bisoprolol 2.5mg OD Ramipril 1.25 mg OD Apixaban 5mg BD Atorvastatin 80mg OD Amlodipine 5mg OD Bumetanide 1mg OD Salbutamol inhaler 2 puffs PRN Seretide 500 BD Spironolactone 25mg OD I reviewed this gentleman in clinic today. He reports feeling well and no specific increase in shortness of breath, np paroxysmal nocturnal dyspnoea and no chest pain. He does report some weight gain over the last few months. His ECG today showed AF with good rate control at 76 bpm. Echocardiogram showed impaired left ventricular systolic function with an ejection fraction of less than 40% Auscultation of his chest revealed fine bi-basal crackles. Pitting oedema was present to both ankles. JVP was not raised. Weight 78 kg This gentleman is generally stable although he may be mildly overloaded at present and could benefit from an increase in his bumetanide from 1-2 mg. He can be referred back to your routine care in the community.	*Notes weight gain and increase in oedema and raised JVP* *Notes suggested titration of diuretic and conside adherence to diuretics*

Prescribing points:
Notes non-adherence of diuretics, considers in context of social history and addresses this.
Reviews HF letter.
Plans baseline eGFR and titration of diuretics with FU and repeat renal function and safety netting
Notes low BP, checks for postural drop.

Considers stopping amlodipine, notes link to ankle swelling Avoids stopping ramipril in context of heart failure. Considers need to review seretide and considers indication for omeprazole.

VIGNETTE 4

Right hand column represents the staged information within the vignette, italics represent key points which may be considered by the clinician

Participant will be presented with Card 1 and then will be required to ask for additional information as they feel is indicated and presented with the appropriate card

CARD 1 **Initial information** 77 year old female Cough	
CARD 2 **Computer summary** **PMH** Type 2 diabetes Hypertension Ca breast - R Mastectomy (2006) Recurrent DVT Polymyalgia rheumatica **Medication:**	***Key points*** ***Differential diagnoses*** *URTI/LRTI* *PE* *Lung pathology/cancer* *GORD*

Ramipril 5mg OD Atorvastatin 20 mg OD Metformin 500mg BD Warfarin Prednisolone 5mg - three daily Omeprazole 20mg OD **Allergies:** Penicillin **Smoker 20/day for last 30 years**	*Ramipril* • *Notes diabetes/control/may affect management* • *Notes prednisolone and blood glucose control* • *Considers warfarin v DOAC* *Notes PMH – Breast Ca and DVT*
CARD 3 **General survey** Attends with daughter Obese. Alert, coughs frequently, chesty sounding cough. Well perfused. Sweaty. Looks exhausted.	
CARD 4 **History of current complaint** Onset of cough and cold 6 days ago. Cough persisting, disturbing at night. Feels exhausted, chest tight, coughing some green sputum. Feels short of breath on exertion No chest pain Eating less. Feels hot and cold at times	*Likely acute LRTI ?bronchitis ? CAP* *Considers COPD in view of smoking hx* *Notes diabetes and increased risk of infection* *Considers PE – may considering risk assessment tool*
CARD 5 **Additional history** No calf swelling No long haul flights/immobilisation/recent surgery. No hospital admissions within the last year	*Considers PE – may consider using risk assessment tool*
CARD 6 **Adherence** Says she takes her medication as prescribed Orders regular from repeats Attends regularly for inr checks – within range	*May consider need for warfarin and pros and cons of switching to DOAC*
CARD 7 **Social history** Lives alone in warden controlled flat Daughter visits daily	

CARD 8 **Vital signs** T 37.6 Pulse 82 regular RR 20 Sats 96% BP 145/95 BM 8.3mmols	*Notes temperature – may want to know OTC meds and if taken paracetamol* *Notes hypertension in context of diabetes, only on 5mg ramipril*
CARD 9 **Physical examination** Talks in full sentences, coughs frequently during consultation ENT normal on examination Chest: Equal expansion, resonant, wheeze throughout with coarse crackles to both bases, clear with coughing	*Indicates likely bronchitis diagnosis*
CARD 10 **OTC medication** Taking cough medicine from pharmacy and Sudafed Taking regular paracetamol, last dose 3 hours ago	*Notes caution with pseudoephedrine and diabetes/hypertension*
CARD 11 **Blood results** HbA1c 8 (3 months ago) eGFR 55 (1 month ago) INR 2.6 (6 weeks ago)	*Considers need to repeat HbA1c and renal function*
CARD 12 **Warning** Penicillin allergy recorded	
CARD 13 **Doxycycline and warfarin** Increased risk of bleeding events Manufacturer advises monitor INR	
CARD 14 **Clarithromycin and warfarin** Increase anticoagulation effect Monitor INR and adjust dose **Clarithromycin and atorvastatin** Increases exposure to atorvastatin – avoid of adjust dose and monitor rhabdomyolysis	
CARD 15 **Warning** This patient is already on prednisolone	

Prescribing points:
May consider bronchitis as diagnosis – may comment that the pharmacological management is similar for CAP and COPD exacerbation – refers to local antibiotic guidelines
Notes penicillin allergy – doxycycline recommended alternative
Considers interaction with warfarin and monitoring
May consider alternative eg clarithromycin – note similar interaction with warfarin and would need to consider statin
May also consider prednisolone and whether would benefit from increasing dose if underlying COPD risks/benefits

Additional:
Considers prednisolone and effect on diabetes management checks dose management for PMR
Advised to stop Sudafed
Considers re-checking HbA1c and diabetes management including BP management

Smoking cessation advice
Considers follow up for spirometry

FU: Gives appropriate advice of when to re-attend. Considers reviewing diagnosis and investigations if symptoms not resolving

Appendix E Adjustments to vignettes following GP and NIP review

	NIP	Action	GP	Action
Trial vignette	Add blood glucose reading	*Blood glucose reading added*	Include photo of the rash. Do you need to consider what responses if they start to ask about asthma control?	*Photo included.* *Card with recent asthma history added.*
Vignette 1	He may not have remembered injuring himself if he has dementia.	*This will be an important factor for participants to consider*	Consider including a photo to assist with diagnosis, and help differentiate from cellulitis. They may want to know about any previous episodes. They may consider the role of allopurinol in management.	*Photo included.* *Past medical history (PMH) does not specify any gout episodes.* *See response from participants.*
Vignette 2	Complex scenario due to PMH. Inclusion of GORD could contribute to symptoms and cause some confusion.	*Remove GORD from PMH*	A lot to consider and more is needed about the context of this presentation. Are they already known to the heart failure team? Balancing renal function heart failure and BP will be tricky. May want to consider addition of spironolactone in due course.	*Frame in the context of known heart failure seen by secondary care. Add a card with details from letter from heart failure review.* *Deliberate challenge for participants to consider.* *Add spironolactone to medications.*

			When is specialist input needed?	*Add letter as above to provide context then participants can consider re-referral if they feel necessary*
Vignette 3	This is more straightforward. Would it be worth putting before Vignette 2? Add blood glucose reading.	*Order is deliberate. If this were to come first it may assist participant with vignette 2 as they may think it unlikely there were two cases of patients with chest infections.* *Blood glucose reading added.*	No addition	*No change*
Additional suggestions	Note the order participants request card. This may be significant in understanding their decision-making processes.	*Order will be noted.*	None	

Appendix F Amendments to vignettes following ANP review

Vignette	Comments/omissions	Amendments
Trial vignette 1	Has he had the rash before?	*Add to card.*
	Any new medications?	*Add to card.*
	Is the rash where the pain is? Is he up to date with immunisations including shingles?	*Add to card.*
	Does he feel well?	*Add to card.*
	More detail on the nature of the pain including pain score. Specify if paracetamol or calamine lotion have helped .	*Add card with more details of pain history and include pain score*
	Has he had chicken pox in the past?	*Verbal response - yes*
	Any changes in washing powder, medications, foods etc.	*Include in history of current complaint*
	When was his last diabetes review?	*Add card*
	How well controlled is his asthma?	*Add card*
Vignette 2	Previous episodes?	*See PMH*
	Any other joint swelling?	*Add to card*
	Diet and alcohol information.	*Add to card*
	Sensation and foot pulses .	*Add to card*
	Has he had any similar episodes and if so how were these treated?	*Verbal response – no*

	When did he last take any painkillers?	*Add to card*
Vignette 3	General impression – how does he look? Have diuretics been adjusted?	*Add to cards* *Amend background to more clearly indicate that the patient is under the heart failure team.*
Vignette 4	None	
General	May not always review home page before calling patient. Needs general impression of patient. Some responses will need to be verbalised.	*Initial card to contain patient demographics and presenting complaint only.* *Card representing general survey.* *Keep a record of these.*

Appendix G Participant information sheet – Pilot study

University of Southampton

Participant Information Sheet – Pilot study

Study Title:
An exploration of the decision-making processes of nurse prescribers in managing acute illness in adults with multimorbidities and polypharmacy presenting to general practice.

Researcher: Annie Herklots
ERGO number: 457455

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully and ask questions if anything is not clear or you would like more information before you decide to take part in this research. You may like to discuss it with others but it is up to you to decide whether or not to take part. If you are happy to participate you will be asked to sign a consent form.

What is the research about?
I am undertaking this research as part of my PhD studies. I am a clinical teaching fellow at the University of Southampton and work as an advanced nurse practitioner in general practice in my clinical role. The aim of this research is to gain an understanding of the decision-making processes of nurse prescribers in general practice in prescribing for adults with multimorbidities (two or more chronic conditions) and polypharmacy (multiple medications) presenting with acute illness. Very little is known about the decision-making processes of nurse prescribers and it is hoped by gaining understanding of these processes, education and resources may be better targeted to help nurse prescribers manage this complex group of patients. This is of particular importance where demands on general practice are increasing in the context of an ageing and increasingly complex patient population.

You have been asked to take part in a pilot study to help refine the methods that will be used for data collection in the main study.

Why have I been asked to participate?
Nurse prescribers working in general practices across the Wessex region who regularly manage this patient population have been invited to take part in the study. You have been selected to take part in the pilot study as you are representative of this group and your experience will help shape the methods used for data collection. As we are clinical colleagues this excludes you from the main study.

What will happen to me if I take part?
If you decide to take part please let me know so that we can arrange a convenient time to meet. The attached consent form will be signed when we meet.

The meeting will last approximately 2.5 hours and will involve you responding to three case studies typical of patients you would see in practice presenting with acute illness and who also have multimorbidities. You will be asked to 'think aloud' your thought processes as you review the case studies and decide on your management plan. This stage is likely to last approximately 30 - 60 minutes. This will be followed by an interview to further explore your experience of the case studies and your views on prescribing for this patient group. This will last between 30-60 minutes. You will then be asked your views regarding the interview process including the content of vignettes, the process of think aloud and the semi-structured interview questions. This is likely to take up to 30 minutes. Your comments will be valuable in refining the data collection process and quality of the research study.

Data from the think aloud process and interview will not be included in the final data analysis as the purpose of your participation is to help refine these methods. The final interview will be audio recorded with your consent.

Are there any benefits in my taking part?
You will be making a valuable contribution to the body of research on nurse prescribing. Additionally you will be offered a £25 gift voucher in appreciation of your participation.

Are there any risks involved?
None identified

What data will be collected?
Data from the final interview containing your views on the data collection process will be audio recorded. This data will be anonymised by allocation of a number. The audio recorder will be encrypted and kept in a locked cabinet and the interview will be downloaded securely onto the university server within 24 hours at which point the audio recording will be destroyed.

Will my participation be confidential?
Your participation and the information collected about you during the course of the research will be kept strictly confidential.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

Interview data will be collected using an encrypted audio recorder and downloaded within 24 hours of the interview and stored securely on the password protected University of Southampton server. The recorded interview will then be deleted from the audio recorder. Data will then be transcribed and any identifiers, such as place names, anonymised and the audio recording deleted. Participants will be identifiable by number only.

Consent forms will be scanned and stored securely on the University of Southampton server within 24 hours. Paper copies will then be shredded

Individual participants will be anonymous in the PhD theses and any publications of the research. There will be no reference to individuals' places or work or their employers who will be referred to only as GP practices in the South of England. Identifiable information will be the geographical location ie. South of England, the participants' job role, the length of time in post and qualifications. It is possible that direct quotes may be used but any identifiable information will be anonymised by allocating participants a number and places of work and colleagues will be referred to in generic terms such as GP or GP practice. Confidentiality of information is assured, although in the unlikely event that evidence of unsafe practice was revealed I would be duty bound to report this to the NMC.

Do I have to take part?
No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, please let me know either by email or in person, you will need to sign a consent form to show you have agreed to take part.

What happens if I change my mind?
You have the right to change your mind and withdraw at any time [illegible] without your participant rights being affected. If you withdraw from the study once data analysis has taken place, only data that has already been obtained for the purposes of achieving the objectives of the study will be kept.

What will happen to the results of the research?
The results will written up in the form of a PhD thesis and may be included in future publications. A summary of the research results will be disseminated via CCG prescribing leads. Your personal details will remain strictly confidential. Research findings made available in any reports or publications will not include information that can directly identify you without your specific consent.

Where can I get more information?
Please contact Annie Herklots at A.D.Herklots@soton.ac.uk

What happens if there is a problem?
If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.
If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Research Integrity and Governance Manager (023 8059 5058, rgoinfo@soton.ac.uk).

Data Protection Privacy Notice
The University of Southampton conducts research to the highest standards of research integrity. As a publicly-funded organisation, the University has to ensure that it is in the public interest when we use personally-identifiable information about people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use information about you in the ways needed, and for the purposes specified, to conduct and complete the research project. Under data protection law, 'Personal data' means any information that relates to and is capable of identifying a living individual. The University's data protection policy governing the use of personal data by the University can be found on its website (https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page).

This Participant Information Sheet tells you what data will be collected for this project and whether this includes any personal data. Please ask the research team if you have any questions or are unclear what data is being collected about you.

Our privacy notice for research participants provides more information on how the University of Southampton collects and uses your personal data when you take part in one of our research projects and can be found at http://www.southampton.ac.uk/assets/sharepoint/intranet/ls/Public/Research%20and%20Integrity%20Privacy%20Notice/Privacy%20Notice%20for%20Research%20Participants.pdf

Any personal data we collect in this study will be used only for the purposes of carrying out our research and will be handled according to the University's policies in line with data protection law. If any personal data is used from which you can be identified directly, it will not be disclosed to anyone else without your consent unless the University of Southampton is required by law to disclose it.

Data protection law requires us to have a valid legal reason ('lawful basis') to process and use your Personal data. The lawful basis for processing personal information in this research study is for the performance of a task carried out in the public interest. Personal data collected for research will not be used for any other purpose.

For the purposes of data protection law, the University of Southampton is the 'Data Controller' for this study, which means that we are responsible for looking after your information and using it properly. The University of Southampton will keep identifiable information about you for 10 years after the study has finished after which time any link between you and your information will be removed.

To safeguard your rights, we will use the minimum personal data necessary to achieve our research study objectives. Your data protection rights – such as to access, change, or transfer such information - may be limited, however, in order for the research output to be reliable and accurate. The University will not do anything with your personal data that you would not reasonably expect.

If you have any questions about how your personal data is used, or wish to exercise any of your rights, please consult the University's data protection webpage (https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page) where you can make a request using our online form. If you need further assistance, please contact the University's Data Protection Officer (data.protection@soton.ac.uk).

Thank you for taking the time to read this information sheet and considering participating in this research.

Appendix H Consent form – Pilot study

University of Southampton

CONSENT FORM – Pilot study

Study title: An exploration of the decision-making processes of nurse prescribers in managing acute illness in patients with multi-morbidities and polypharmacy presenting to general practice.

Researcher name: Annie Herklots
ERGO number: 45755
Participant Identification Number (if applicable):

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet V2 28/10/18 and have had the opportunity to ask questions about the study.	
I agree to take part in this research project and agree for my data to be used for the purpose of this study.	
I agree to take part in the 'think aloud' study and for this to be audio recorded	
I agree to be interviewed for the purpose of this research and agree for the interview to be audio recorded	
I understand that taking part in the study involves audio recording which will be transcribed for the purposes set out in the participation information sheet and then destroyed.	
Confidentiality will be maintained other than in situations where disclosure is required by professional codes of conduct (NMC 2015)	
I understand that my personal information collected about me such as my name or where I live will not be shared beyond the study team.	
I understand my participation is voluntary and I may withdraw at any time for any reason without my participation rights being affected.	
I understand that if I withdraw from the study that it may not be possible to remove the data once my personal information is no longer linked to the data.	

Name of participant (print name).....

Signature of participant.....

Date.....

Name of researcher (print name).....

Signature of researcher .....

Date.....

[15/12/18] [Version Number 3] [IRAS reference 251810]

Appendix I Participant letter

UNIVERSITY OF Southampton

Dear Participant,

I am currently undertaking research into nurse prescribing in general practice. I am a clinical teaching fellow at the University of Southampton and work as an advanced nurse practitioner in general practice in my clinical role. I am particularly interested in the decision making processes that are used by nurse prescribers in managing patients with multi-morbidity presenting with acute illness. This study is the focus of my PhD studies and I would very much value your participation.

The research will involve you thinking aloud your decision-making in response to three written case scenarios. These will represent typical general practice presentations of patients with an acute illness episode, such as a chest infection, on the background of multi-morbidity and polypharmacy. This will then be followed by a short interview to further explore your decision-making and your views of prescribing for this group. This is likely to take up to two hours and can be arranged at a time convenient to you.

I am able to offer a £25 gift token in appreciation of your participation.

It is hoped that this study will contribute to the body of research around nurse prescribing particularly in equipping future prescribers to manage the complexity of presentations seen in general practice.

If you are interested in taking part please see the attached information sheet and consent form and contact me to arrange a time to discuss this further. Your participation would be greatly appreciated.

Yours faithfully,

Annie Herklots
Clinical Teaching Fellow
University of Southampton
Email: A.D.Herklots@soton.ac.uk

Appendix J Participant information sheet – main study

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Participant Information Sheet - main study

Study Title:

An exploration of the decision-making processes of nurse prescribers in managing acute illness in adults with multimorbidities and polypharmacy presenting to general practice.

Researcher: Annie Herklots
ERGO number: 45755

You are being invited to take part in the above research study. To help you decide whether you would like to take part or not, it is important that you understand why the research is being done and what it will involve. Please read the information below carefully and ask questions if anything is not clear or you would like more information before you decide to take part in this research. You may like to discuss it with others but it is up to you to decide whether or not to take part. If you are happy to participate you will be asked to sign a consent form.

What is the research about?
I am undertaking this research as part of my PhD studies. I am a clinical teaching fellow at the University of Southampton and work as an advanced nurse practitioner in general practice in my clinical role. The aim of this research is to gain an understanding of the decision-making processes of nurse prescribers in general practice in prescribing for adults with multimorbidities (two or more chronic conditions) and polypharmacy (multiple medications) presenting with acute illness. Very little is known about the decision-making processes of nurse prescribers and it is hoped by gaining understanding of these processes, education and resources may be better targeted to help nurse prescribers manage this complex group of patients. This is of particular importance where demands on general practice are increasing in the context of an ageing and increasingly complex patient population.

Why have I been asked to participate?
Nurse prescribers working in general practices across the Wessex region who regularly manage this patient population have been invited to take part in the study. Your practice manager and/or CCG prescribing lead has been asked to forward you details of this study.

What will happen to me if I take part?
If you decide to take part please contact me via the email address below. I will then contact you to discuss arrangements and arrange a convenient time to meet. The attached consent form will be signed when we meet.

The meeting will last approximately 2 hours and will involve you responding to three case studies typical of patients you would see in practice presenting with acute illness and who also have multimorbidities. You will be asked to 'think aloud' your thought processes as you review the case studies and decide on your management plan. This stage is likely to last approximately 30 - 60 minutes. This will be followed by an interview to further explore your experience of the case studies and your views on prescribing for this patient group. This will last between 30-60 minutes. These processes will be audio recorded with your consent.

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Are there any benefits in my taking part?
You will be making a valuable contribution to the body of research on nurse prescribing. Additionally, you will be offered a £25 gift token in appreciation of your participation in the research

Are there any risks involved?
None identified

What data will be collected?
Data containing your name and contact details will be used for contact purposes. This data will be stored on a printed document which will be kept in a locked filing cabinet. This will be shredded on completion of the interviews.

Verbal data from think aloud and semi-structured interviews will be audio recorded. This will also include information regarding professional qualifications and relevant career experience. All data from the interviews will be anonymised by allocation of a number. The audio recorder will be encrypted and kept in a locked cabinet and the interview will be downloaded securely onto the university server within 24 hours at which point the audio recording will be destroyed.

Will my participation be confidential?
Your participation and the information collected about you during the course of the research will be kept strictly confidential.

Only members of the research team and responsible members of the University of Southampton may be given access to data about you for monitoring purposes and/or to carry out an audit of the study to ensure that the research is complying with applicable regulations. Individuals from regulatory authorities (people who check that we are carrying out the study correctly) may require access to your data. All of these people have a duty to keep your information, as a research participant, strictly confidential.

Interview data will be collected using an encrypted audio recorder and downloaded within 24 hours of the interview and stored securely on the password protected University of Southampton server. The recorded interview will then be deleted from the audio recorder. Data will then be transcribed and any identifiers, such as place names, anonymised and the audio recording deleted. Participants will be identifiable by number only.

Consent forms will be scanned and stored securely on the University of Southampton server within 24 hours. Paper copies will then be shredded.

Individual participants will be anonymous in the PhD theses and any publications of the research. There will be no reference to individuals' places or work or their employers who will be referred to only as GP practices in the South of England. Identifiable information will be the geographical location ie. South of England, the participants' job role, the length of time in post and qualifications. It is possible that direct quotes may be used but any identifiable information will be anonymised by allocating participants a number and places of work and colleagues will be referred to in generic terms such as GP or GP practice. Confidentiality of information is assured, although in the unlikely event that evidence of unsafe practice was revealed I would be duty bound to report this to the NMC.

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Do I have to take part?
No, it is entirely up to you to decide whether or not to take part. If you decide you want to take part, you will need to contact me via the email address below and you will be required to sign a consent form to show you have agreed to take part.

What happens if I change my mind?
You have the right to change your mind and withdraw at any time without giving a reason and without your participant rights being affected. If you withdraw from the study once data analysis has taken place, only data that has already been obtained for the purposes of achieving the objectives of the study will be kept.

What will happen to the results of the research?
The results will written up in the form of a PhD thesis and may be included in future publications. A summary of the research results will be disseminated via CCG prescribing leads. Your personal details will remain strictly confidential. Research findings made available in any reports or publications will not include information that can directly identify you.

Where can I get more information?
Please contact Annie Herklots at A.D.Herklots@soton.ac.uk

What happens if there is a problem?
If you have a concern about any aspect of this study, you should speak to the researchers who will do their best to answer your questions.
If you remain unhappy or have a complaint about any aspect of this study, please contact the University of Southampton Research Integrity and Governance Manager (023 8059 5058, rgoinfo@soton.ac.uk).

Data Protection Privacy Notice
The University of Southampton conducts research to the highest standards of research integrity. As a publicly-funded organisation, the University has to ensure that it is in the public interest when we use personally-identifiable information about people who have agreed to take part in research. This means that when you agree to take part in a research study, we will use information about you in the ways needed, and for the purposes specified, to conduct and complete the research project. Under data protection law, 'Personal data' means any information that relates to and is capable of identifying a living individual. The University's data protection policy governing the use of personal data by the University can be found on its website (https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page).

This Participant Information Sheet tells you what data will be collected for this project and whether this includes any personal data. Please ask the research team if you have any questions or are unclear what data is being collected about you.

Our privacy notice for research participants provides more information on how the University of Southampton collects and uses your personal data when you take part in one of our research projects and can be found at
http://www.southampton.ac.uk/assets/sharepoint/intranet/ls/Public/Research%20and%20Integrity%20Privacy%20Notice/Privacy%20Notice%20for%20Research%20Participants.pdf

Any personal data we collect in this study will be used only for the purposes of carrying out our research and will be handled according to the University's policies in line with data protection law. If any personal data is used from which you can be identified directly, it will not be disclosed to anyone else without your consent unless the University of Southampton is required by law to disclose it.

Data protection law requires us to have a valid legal reason ('lawful basis') to process and use your Personal data. The lawful basis for processing personal information in this research study is for the performance of a task carried out in the public interest. Personal data collected for research will not be used for any other purpose.

For the purposes of data protection law, the University of Southampton is the 'Data Controller' for this study, which means that we are responsible for looking after your information and using it properly. The University of Southampton will keep identifiable information about you for 10 years after the study has finished after which time any link between you and your information will be removed.

To safeguard your rights, we will use the minimum personal data necessary to achieve our research study objectives. Your data protection rights – such as to access, change, or transfer such information - may be limited, however, in order for the research output to be reliable and accurate. The University will not do anything with your personal data that you would not reasonably expect.

If you have any questions about how your personal data is used, or wish to exercise any of your rights, please consult the University's data protection webpage (https://www.southampton.ac.uk/legalservices/what-we-do/data-protection-and-foi.page) where you can make a request using our online form. If you need further assistance, please contact the University's Data Protection Officer (data.protection@soton.ac.uk).

Thank you for taking the time to read this information sheet and considering participating in this research.

Appendix K Consent form – main study

University of Southampton

CONSENT FORM – Main study

Study title: An exploration of the decision-making processes of nurse prescribers in managing acute illness in patients with multi-morbidities and polypharmacy presenting to general practice.

Researcher name: Annie Herklots
ERGO number: 45755
Participant Identification Number (if applicable):

Please initial the box(es) if you agree with the statement(s):

I have read and understood the information sheet V2 28/10/18 and have had the opportunity to ask questions about the study.	
I agree to take part in this research project and agree for my data to be used for the purpose of this study	
I agree to take part in the 'think aloud' study and for this to be audio recorded	
I agree to be interviewed for the purpose of this research and agree for the interview to be audio recorded	
I understand that taking part in the study involves audio recording which will be transcribed and then destroyed for the purposes set out in the participation information sheet.	
Confidentiality will be maintained other than in situations where disclosure is required by professional codes of conduct (NMC 2015)	
I understand that I may be quoted directly in reports of the research but that I will not be directly identified (e.g. that my name will not be used).	
I understand that my personal information collected about me such as my name or where I live will not be shared beyond the study team.	
I understand my participation is voluntary and I may withdraw at any time for any reason without my participation rights being affected.	
I understand that if I withdraw from the study that it may not be possible to remove the data once my personal information is no longer linked to the data.	

Name of participant (print name).....

Signature of participant.....

Date.....

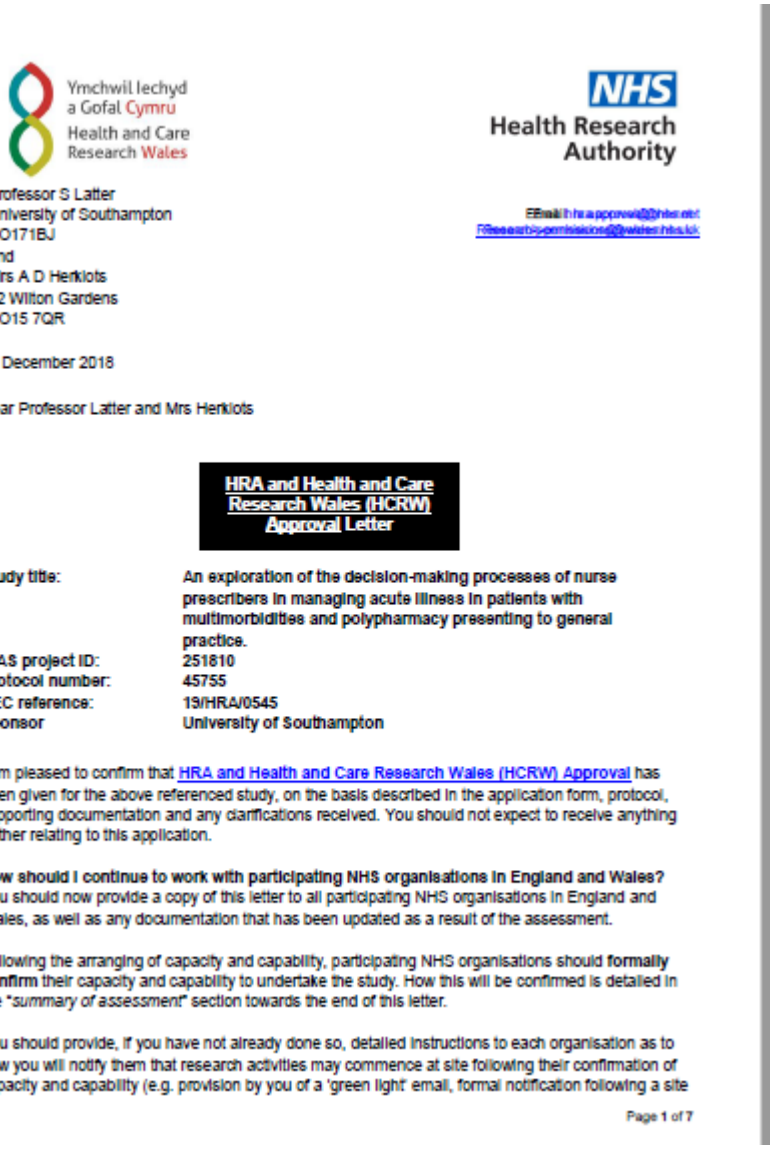
Name of researcher (print name).....

Signature of researcher .....

Date.....

[Date 15/12/18 [Version Number 3] [IRAS reference 251810]

Appendix L HRA approval letter



Ymchwil Iechyd a Gofal Cymru
Health and Care Research Wales

NHS
Health Research Authority

Professor S Latter
University of Southampton
SO171BJ
and
Mrs A D Herklots
52 Wilton Gardens
SO15 7QR

17 December 2018

Dear Professor Latter and Mrs Herklots

HRA and Health and Care Research Wales (HCRW) Approval Letter

Study title:	**An exploration of the decision-making processes of nurse prescribers in managing acute illness in patients with multimorbidities and polypharmacy presenting to general practice.**
IRAS project ID:	**251810**
Protocol number:	**45755**
REC reference:	**13/HRA/0545**
Sponsor	**University of Southampton**

I am pleased to confirm that HRA and Health and Care Research Wales (HCRW) Approval has been given for the above referenced study, on the basis described in the application form, protocol, supporting documentation and any clarifications received. You should not expect to receive anything further relating to this application.

How should I continue to work with participating NHS organisations in England and Wales?
You should now provide a copy of this letter to all participating NHS organisations in England and Wales, as well as any documentation that has been updated as a result of the assessment.

Following the arranging of capacity and capability, participating NHS organisations should **formally confirm** their capacity and capability to undertake the study. How this will be confirmed is detailed in the "*summary of assessment*" section towards the end of this letter.

You should provide, if you have not already done so, detailed instructions to each organisation as to how you will notify them that research activities may commence at site following their confirmation of capacity and capability (e.g. provision by you of a 'green light' email, formal notification following a site

initiation visit, activities may commence immediately following confirmation by participating organisation, etc.).

It is important that you involve both the research management function (e.g. R&D office) supporting each organisation and the local research team (where there is one) in setting up your study. Contact details of the research management function for each organisation can be accessed here.

How should I work with participating NHS/HSC organisations in Northern Ireland and Scotland? (If applicable)

HRA and HCRW Approval does not apply to NHS/HSC organisations within the devolved administrations of Northern Ireland and Scotland.

If you indicated in your IRAS form that you do have participating organisations in either of these devolved administrations, the final document set and the study wide governance report (including this letter) has been sent to the coordinating centre of each participating nation. You should work with the relevant national coordinating functions to ensure any nation specific checks are complete, and with each site so that they are able to give management permission for the study to begin.

Please see IRAS Help for information on working with NHS/HSC organisations in Northern Ireland and Scotland.

How should I work with participating non-NHS organisations? (If applicable)

HRA and HCRW Approval does not apply to non-NHS organisations. You should work with your non-NHS organisations to obtain local agreement in accordance with their procedures.

The attached document *"After HRA Approval – guidance for sponsors and investigators"* gives detailed guidance on reporting expectations for studies with HRA and HCRW Approval, including:

- Registration of Research
- Notifying amendments
- Notifying the end of the study

The HRA website also provides guidance on these topics and is updated in the light of changes in reporting expectations or procedures.

I am a participating NHS organisation. What should I do once I receive this letter as part of the Local Information Pack?

You should work with the applicant and sponsor to arrange capacity and capability in line with the information provided in the *"How should I work with my participating NHS organisations in England and Wales?"* section above. I have also provided you with further information to aid study set up in the *"Information for Sponsors and Participating NHS Organisations"* section towards the end of this document.

IRAS project ID	251810

The sponsor contact for this application is as follows:

Name: Ms Letitia Baldock
Tel: 02380 595058
Email: L.Baldock@soton.ac.uk

Who should I contact for further information?
Please do not hesitate to contact me for assistance with this application. My contact details are below.

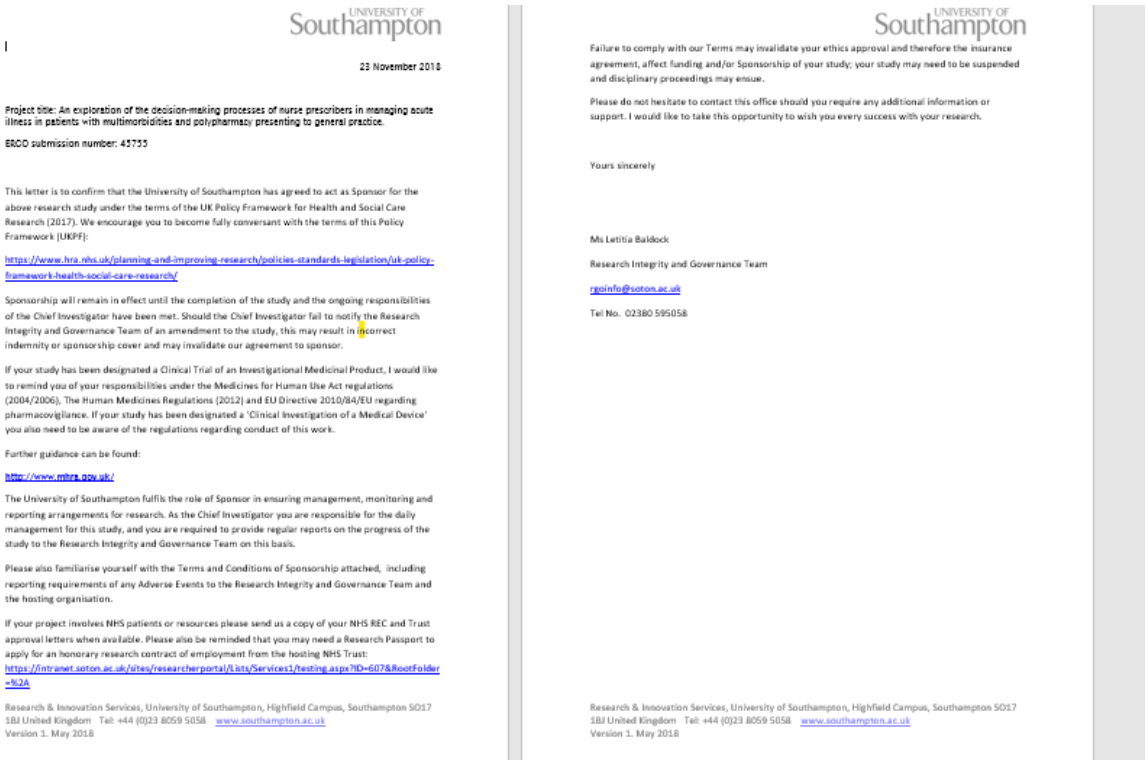
Your IRAS project ID is **251810**. Please quote this on all correspondence.

Yours sincerely

Isobel Lyle | Senior Assessor
Health Research Authority
T: 0207 972 2496
Holland Dr, Newcastle upon Tyne NE2 4NQ
Hra.approval@nhs.net or Isobel.lyle@nhs.net
www.hra.nhs.uk

Copy to: *Ms Letitia Baldock, Sponsor contact, University of Southampton*
Alex Jones, R&D contact, CRN Wessex

Appendix M Sponsor letter UoS



UNIVERSITY OF Southampton

23 November 2018

Project title: An exploration of the decision-making processes of nurse prescribers in managing acute illness in patients with multimorbidities and polypharmacy presenting to general practice.

ERGO submission number: 45755

This letter is to confirm that the University of Southampton has agreed to act as Sponsor for the above research study under the terms of the UK Policy Framework for Health and Social Care Research (2017). We encourage you to become fully conversant with the terms of this Policy Framework (UKPF):

https://www.hra.nhs.uk/planning-and-improving-research/policies-standards-legislation/uk-policy-framework-health-social-care-research/

Sponsorship will remain in effect until the completion of the study and the ongoing responsibilities of the Chief Investigator have been met. Should the Chief Investigator fail to notify the Research Integrity and Governance Team of an amendment to the study, this may result in incorrect indemnity or sponsorship cover and may invalidate our agreement to sponsor.

If your study has been designated a Clinical Trial of an Investigational Medicinal Product, I would like to remind you of your responsibilities under the Medicines for Human Use Act regulations (2004/2006), The Human Medicines Regulations (2012) and EU Directive 2010/84/EU regarding pharmacovigilance. If your study has been designated a 'Clinical Investigation of a Medical Device' you also need to be aware of the regulations regarding conduct of this work.

Further guidance can be found:

http://www.mhra.gov.uk/

The University of Southampton fulfils the role of Sponsor in ensuring management, monitoring and reporting arrangements for research. As the Chief Investigator you are responsible for the daily management for this study, and you are required to provide regular reports on the progress of the study to the Research Integrity and Governance Team on this basis.

Please also familiarise yourself with the Terms and Conditions of Sponsorship attached, including reporting requirements of any Adverse Events to the Research Integrity and Governance Team and the hosting organisation.

If your project involves NHS patients or resources please send us a copy of your NHS REC and Trust approval letters when available. Please also be reminded that you may need a Research Passport to apply for an honorary research contract of employment from the hosting NHS Trust: https://intranet.soton.ac.uk/sites/researcherportal/Lists/Services1/testing.aspx?ID=607&RootFolder=%2A

Research & Innovation Services, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom Tel: +44 (0)23 8059 5058 www.southampton.ac.uk
Version 1. May 2018

UNIVERSITY OF Southampton

Failure to comply with our Terms may invalidate your ethics approval and therefore the insurance agreement, affect funding and/or Sponsorship of your study; your study may need to be suspended and disciplinary proceedings may ensue.

Please do not hesitate to contact this office should you require any additional information or support. I would like to take this opportunity to wish you every success with your research.

Yours sincerely

Ms Letitia Baldock

Research Integrity and Governance Team

rgoinfo@soton.ac.uk

Tel No. 02380 595058

Research & Innovation Services, University of Southampton, Highfield Campus, Southampton SO17 1BJ United Kingdom Tel: +44 (0)23 8059 5058 www.southampton.ac.uk
Version 1. May 2018

Appendix N Wessex CRN Letter of Access

NHS
National Institute for Health Research

Clinical Research Network Wessex
Unit 7
Berrywood Business Village
Tollbar Way
Hedge End
Southampton
SO30 2UN

Tel: 01489 771 110
Email: studysupport1.crnwessex@nihr.ac.uk

14th February 2019

Dear Mrs Annabel Herklots

Re: IRAS ID: 251810
Study Title: An Exploration of the Decision-Making Processes of Nurse Prescribers

Letter of access for research

The information supplied about your role in research within the NIHR Clinical Research Network Wessex area has been reviewed and you do not require an honorary research contract. We are satisfied that such pre-engagement checks as we consider necessary have been carried out.

You may present this assurance to an independent contractor within CRN: Wessex[1] when negotiating access to conduct research. This assurance is effective from **14/02/2019** and will continue to be valid until your contract of employment has ended, unless terminated earlier in accordance with the clauses below. If your current contract is extended you will not be required to reapply, however you may be asked by hosting Independent Contractors to show proof of employment along with this letter.

Guidance for Independent Contractors receiving this Letter of HR Assurance

The subject of this assurance is considered to be a legal visitor to your premises. The subject is not entitled to any form of payment or access to other benefits provided by you to employees and this letter does not give rise to any other relationship between the subject and you, in particular that of an employee.

While undertaking research through your premises, the subject will remain accountable to their employer, **University of Southampton**, but they are required to follow your reasonable instructions or those given on your behalf in relation to the terms of access.

Where any third-party claim is made, whether or not legal proceedings are issued, arising out of or in connection with your right of access, the subject is required to co-operate fully with your investigations in connection with any such claim and to give all such assistance as may reasonably be required regarding the conduct of any legal proceedings.

The subject must act in accordance with your policies and procedures, which you should make available upon request, and with the Research Governance Framework.

The subject is required to co-operate with you in discharging your duties under the Health and Safety at Work etc Act 1974 and other health and safety legislation and to take reasonable care for the health and safety of themselves and others while on your premises. Although not a contract holder, the subject must observe the same standards of care and propriety in dealing with patients, staff, visitors, equipment and premises as is expected of a contract holder and must act appropriately, responsibly and professionally at all times.

If the subject has a physical or mental health condition or disability which may affect their research role and which might require special adjustments to their role, if they have not already done so, they must notify you and their employer prior to commencing their research role with you.

The subject of this assurance is required to ensure that all information regarding patients or staff remains secure and *strictly confidential* at all times. They must ensure that they understand and comply with the requirements of the NHS Confidentiality Code of Practice (http://www.dh.gov.uk/assetRoot/04/06/92/54/04069254.pdf) and the Data Protection Act 1998. Furthermore they should be aware that under the Act, unauthorised disclosure of information is an offence and such disclosures may lead to prosecution.

As an Independent Contractor you will not indemnify the subject against any liability incurred as a result of any breach of confidentiality or breach of the Data Protection Act 1998. Any breach of the Data Protection Act 1998 may result in legal action against them and/or their substantive employer.

The subject should ensure that, where they are issued with an identity or security card, a bleep number, email or library account, keys or protective clothing, these are returned upon termination of this arrangement. They should also ensure that while on the premises they wear their ID badge at all times, or are able to prove their identity if challenged. As an Independent Contractor you accept no responsibility for damage to or loss of personal property.

You may terminate the subject's access at any time. We would suggest that this should be either by giving seven days' written notice to the subject or immediately without any notice if they are in breach of any of the terms or conditions described in this letter or if they commit any act that you reasonably consider to amount to serious misconduct or to be disruptive and/or prejudicial to your interests and/or business or if they are convicted of any criminal offence. The subject must not undertake regulated activity if they are barred from such work. If the subject is barred from working with adults or children you may immediately terminate their access. Their employer should immediately withdraw them from undertaking this or any other regulated activity and they MUST stop undertaking any regulated activity immediately.

The subject's substantive employer is responsible for their conduct during this research project and may in the circumstances described above instigate disciplinary action against them.

If the subject's circumstances change in relation to their health, criminal record, professional registration or suitability to work with adults or children, or any other aspect that may impact on their suitability to conduct research, or their role in research changes, they must inform their substantive employer through its normal procedures. They must also inform you.

Yours sincerely

Tsiloon Li
Assistant Portfolio Manager
Study Support Service

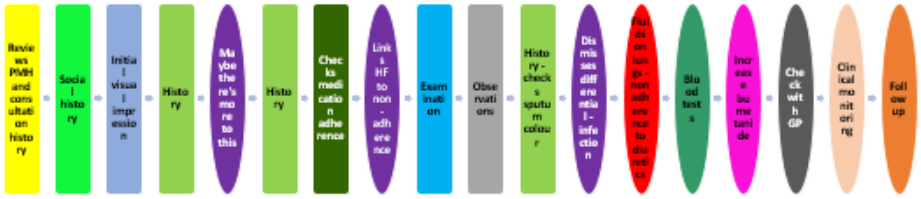
C.C. Study Manager (if applicable)
HR Department of the Substantive Employer

Appendix O Summary of consultation analysis – vignette 3

Colour code:

Participant 1

Participant 2



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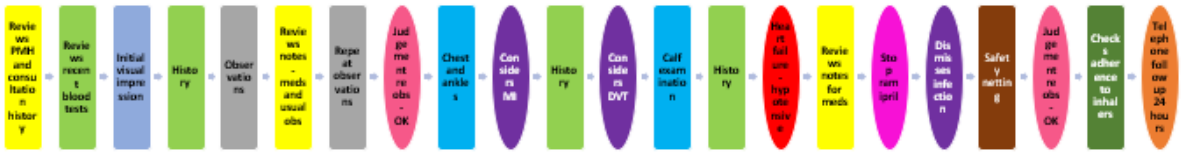

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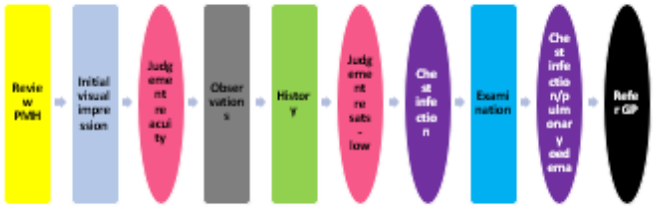
Participant 5



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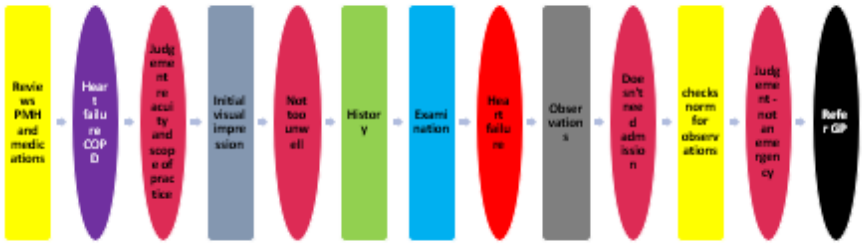

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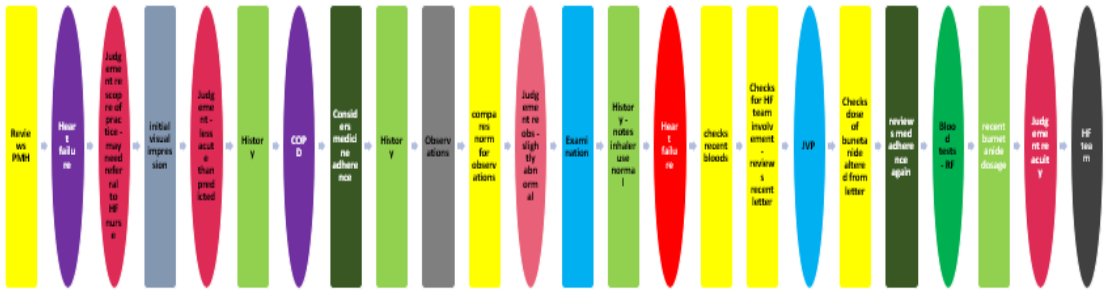
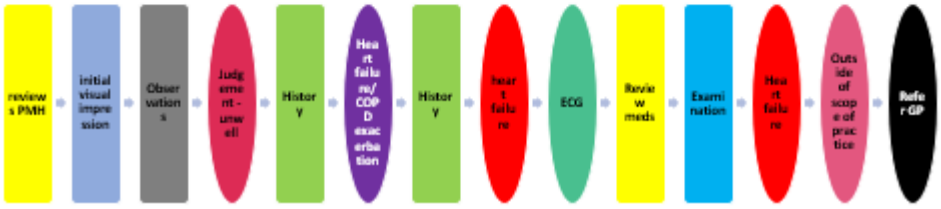


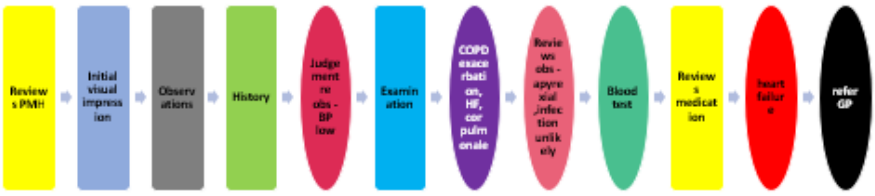
Participant 8

Participant 9



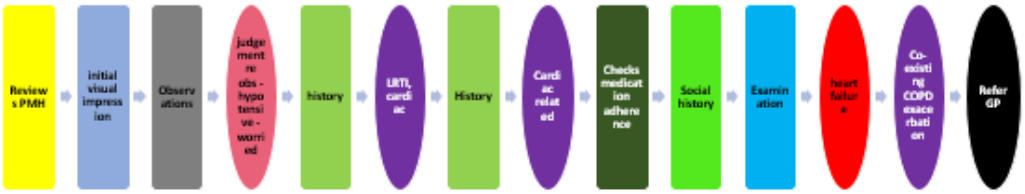
Participant 10

Participant 11

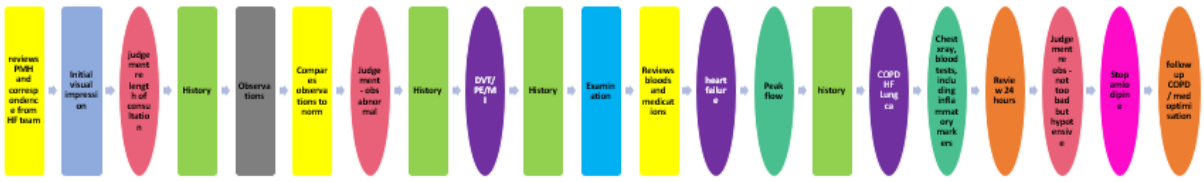


Participant 12

Participant 13



Participant 14



Appendix P Summary of prescribing decision analysis – vignette 1

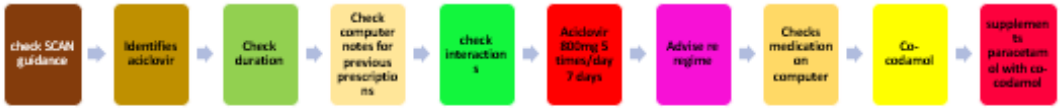
Code

NB it can be assumed that all participants went through a stage of checking interactions on the computer as this is an integral part of the process of prescribing on the computer, but it was not verbalised by all. Data for participant 1 was not available.

Participant 2

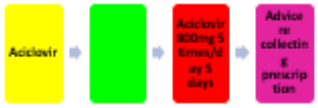
Participant 3

Participant 4

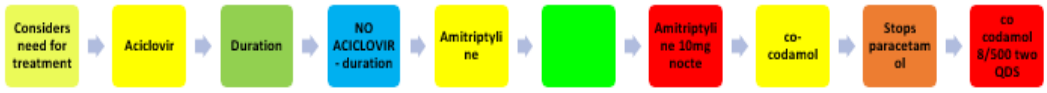


Participant 5

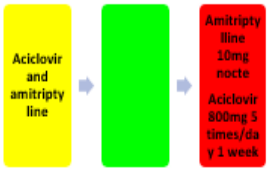
Participant 6



Participant 7



Participant 8



Participant 9

Participant 10

Participant 11

Participant 12

Participant 13

Participant 14

Appendix Q Summary of response to key issues – vignette 2

VIGNETTE 2		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14
Management of presenting complaint															
Diagnosis: Acute heart failure		Yes	Yes	Yes	Yes	Not decisive	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not decisive
Recognises non-adherence to diuretic as contributory factor		No	Yes	No	No	No	No	Yes	No	No	No	No	No	Yes	No
Considers PMH in context of presenting complaint		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Considers differential diagnoses		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Explores key heart failure symptoms in history		Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	To some extent
Notes amlodipine and ankle swelling		No	No	No	No	No	No	Yes	No	No	No	No	Yes	No	Yes
Notes HF and requests details of latest letter. Notes:	Weight gain	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	No
	Increased JVP	No	No	No	No	No	No	Yes	No	No	Yes	No	Not explicit	No	No
	Increased ankle oedema	yes	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	No
	Recommend increase in diuretic	yes	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	Yes

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