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TITLE PAGE

A systematic review of the influences on prescribing decision-making among non-medical prescribers in the United Kingdom

Article Category: Review

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ABSTRACT

Background Suitably qualified non-medical healthcare professionals may now prescribe medicines. Prescribing decision-making can be complex and challenging; a number of influences have been identified among medical prescribers but little appears to be known about influences among non-medical prescribers (NMPs).

Objective To critically appraise, synthesize and present evidence on the influences on prescribing decision-making among supplementary and independent NMPs in the United Kingdom.

Methods The systematic review included all studies between 2003 and June 2013. Included studies researched the prescribing decision-making of supplementary and independent NMPs practising in the UK; all primary and secondary study designs were considered. Studies were assessed for quality and data extracted independently by two researchers, and findings synthesised using a narrative approach.

Results Following duplicates exclusion , 886 titles, 349 abstracts and 40 full studies were screened. Thirty-seven were excluded leaving three for quality assessment and data extraction. While all studies reported aspects of prescribing decision-making this was not the primary research aim for any. Studies were carried out in primary care almost exclusively among nurse prescribers (n=67). Complex influences were evident such as experience in the role, the use of evidence-based guidelines and peer support and encouragement from doctors; these helped participants to feel more knowledgeable and confident about their prescribing decisions. Opposing influences included prioritisation of experience and concern about complications over evidence base, and peer conflict.

Conclusion While there is a limited evidence base on NMPs' prescribing decision-making, it appears that this is complex with NMPs influenced by many and often opposing factors.

INTRODUCTION

Suitably qualified non-medical healthcare professionals, largely nurses and pharmacists, may now prescribe medicines for their patients. Non-medical prescribing has developed according to different models across the world, reflecting different healthcare systems [1, 2, 3, 4, 5]. Nurse prescribing has been implemented in the United States of America (USA), Canada, Australia, New Zealand, the Republic of Ireland, Finland, Sweden, the Netherlands, Spain, and the United Kingdom (UK) although frameworks within which this occurs vary markedly [1, 6]. Pharmacists have prescribing authority in Canada, USA, New Zealand and the UK [7, 8]; again the model varies.

Notwithstanding this variation, development of non-medical prescribing across the world has been driven by a desire to improve access to medicines, sometimes in response to geographical isolation, to improve the quality of care and to make best use of healthcare professionals' skills [6, 9]. In most countries, non-medical prescribers (NMPs) work in collaboration with a supervising doctor to treat patients for previously-diagnosed or pre-specified conditions [5, 9, 10]. In the UK and certain other countries additionally qualified NMPs practise within their competence as independent prescribers responsible for patient care including diagnosis and prescribing from largely the same range of medicines as doctors across a wide range of acute, chronic and complex conditions in primary and secondary care [10,11]. In the UK 'community practitioner nurse prescribers' prescribe from a restricted range of products, primarily wound dressings and products for minor ailments and symptomatic relief. The mode and scope of their practice is very limited, as was that of extended formulary nurse prescribers; this role ceased in 2006 with the implementation of independent nurse prescribing. These categories of nurse prescribers fall out with the definition of 'supplementary and independent prescribers' in the UK legislative prescribing framework. There are plans to extend both the range and scope of non-medical prescribing still further [1, 12, 13, 14].

Whatever the profession, practice setting or clinical area, prescribing decision-making is a key skill for all prescribers. It is one of the cornerstones of patient safety [15] and, like all decision-making, can be challenging. In addition to clinical aspects, prescribers' and patients' health beliefs and behaviours are influential. Newell and Simon [16] described problem solving as a step-wise process of iterative hypothesis development and testing, moderated by the application of heuristics (i.e. a practical method not intended to be optimal or perfect) and/or algorithms informing the development of a plan. The process is evaluated and a final proposed solution arrived at and again tested for suitability. This model may be applied to prescribing decision-making where 'heuristics' may be considered to equate to prescribers' attributes and experiences, and clinical guidelines may approximate to 'algorithms'. Research into doctors' prescribing decision-making, mainly in primary care, has identified the importance of both types of influences with on-going debate about their relative significance [17, 18]. In 1992 Bradley published a critical incident study on 'uncomfortable' prescribing decisions among general practitioners (GPs) in England, providing evidence that their decisions were based on a variety of clinical and non-clinical influences including patient expectations, the doctor-patient relationship and the doctor's previous behaviour [17]. GPs' discomfort around some of their prescribing decisions was multifactorial. This seminal paper acted as a stimulus to further qualitative research [19, 20, 21, 22, 23, 24, 25, 26, 27].

Prescribing decision-making is therefore clearly complex and challenging; a number of influences have been identified among medical prescribers but little appears to be known about such influences among NMPs. There is limited evidence regarding non-medical prescribing decision-making although it has been evaluated as safe across a range of settings [28, 29, 30, 31]. NMPs assert that they adhere strictly to evidence-based practice [28], yet this may not always be the case [32, 33]. NMPs have disparate professional backgrounds but unlike doctors, none comes from a tradition of sometimes paternalistic relationships with patients or from a position at the top of the healthcare hierarchy [34, 35]. It may be that their prescribing decisions are informed by different or additional influences to those

of doctors. It is essential that their prescribing decision-making processes are understood so that they may be optimised for patients' benefit. Systematic reviews constitute the highest level of evidence [36]; a search in eight appropriate databases found no systematic review in this area. The aim of the systematic review was to critically appraise, synthesise and present the evidence on influences on prescribing decision-making among supplementary and independent NMPs in the UK. Given the variation in cultures, health systems and non-medical prescribing practice across the world the review was restricted to studies examining practice in the UK.

METHODS

The systematic review protocol development was informed by standard guidance [37] and registered with PROSPERO at the Centre for Reviews and Dissemination, University of York, United Kingdom (registration number CRD42013004729).

Inclusion criteria

Studies researched the prescribing decision-making of supplementary and independent NMPs practising in the UK. All primary and secondary study designs were considered, with searching limited to articles published from 2003, the start of implementation of non-medical prescribing in the UK, to June 2013.

Exclusion criteria

Studies focusing on the administration or supply of medicines via patient group directions were excluded, as were abstracts, conference proceedings, editorials and letters. Multi-professional studies where no data were reported according to participants' professions were also excluded.

Search strategy

The following databases were searched: Cumulative Index to Nursing & Allied Health Literature (CINAHL), Education Resources Information Centre (ERIC), Google Scholar,

International Pharmaceutical Abstracts, Medline, PsycARTICLES, and The Cochrane Library. Search terms were: prescrib* and (pharmacist* or nurse* or physiotherapist* or podiatrist* or radiographer* or optometrist*) and (influenc* or decision* or decid* or judge* or factor*). References lists were scrutinised and any additional relevant titles included. During title, abstract and full paper screening, inter-rater reliability was confirmed by two independent researchers (TM and one other of SC, DS and KFM) comparing a random sample of 10% of titles, abstracts and full papers.

Quality assessment, data extraction and synthesis

Studies were assessed for quality using a standard tool [38]; quality assessment was carried out independently by two researchers (TM and one other of SC, DS and KFM) and any disagreements resolved by discussion. A data extraction tool was prepared, piloted and used according to the review protocol; data extraction was conducted independently by two researchers, as described above. Review findings were synthesised using a narrative approach.

Outcomes

The primary outcome identified influences on prescribing decision-making by non-medical prescribers; secondary outcomes included their management of otitis media and respiratory tract infections and their pharmacological knowledge and decision-making. Given the small number of papers retrieved it was decided not to exclude any based on quality.

RESULTS

Following exclusion of duplicates, 886 titles, 349 abstracts and 40 full studies were screened sequentially. Thirty-seven studies were excluded for the following reasons: no NMP prescribing decision-making described (n=27); included only extended formulary nurse prescribers (n=3); setting outwith the UK (n=2); while published post 2003, recruitment of study participants pre-2003 (n=2); and medical and non-medical

prescribers not differentiated in reporting of results (n=3). The PRISMA flow diagram is given in Figure 1 [39].

[Insert Figure 1.]

Quality assessment was conducted on the three remaining studies, all of which employed qualitative methodologies, as described in Table 1. Key strengths of the studies included the justification and appropriateness of the qualitative approaches and corresponding study designs. Two of the studies provided clear statements of study aims [32, 33]; this was absent in the third [40]. Study limitations were: a general lack of detail over recruitment strategies and processes (e.g. one study described purposive sampling but with no further details of strata [40]; no justification of sample size and consideration of saturation; and the absence in two of the studies of any theoretical underpinning in the construction of the data generation tools and data analysis [32, 33]. The third study [40] applied to Hammond's Cognitive Continuum Theory which places the cognitive activities of decision-makers into six broad categories: scientific experiment; controlled trial; quasi-experiment; system aided judgement; peer-aided judgement; and intuitive judgement [41].

[Insert Table 1.]

Despite study limitations all were included in data extraction, results of which are provided in Table 2. While all studies reported aspects of prescribing decision-making, this was not the primary research aim for any. The aims centred around: use of evidence based guidelines in the management of otitis media [32]; experience of consultations for respiratory tract infections [33]; and exploring pharmacological knowledge and decision-making around given scenarios [40]. Studies were carried out in primary care almost exclusively among nurse prescribers (n=67); only one pharmacist prescriber and one

physiotherapist prescriber were included in one focus group and results from the focus group were not differentiated according to profession [33].

[Insert Table 2.]

Philp and Winfield studied nurse prescribers treating otitis media in children. While participants reported valuing and using evidence-based guidelines to inform their prescribing decision-making, they felt that guidelines were not appropriate in all circumstances and sometimes prioritised their experience over guidelines when prescribing antibiotics. Prescriber concerns about possible clinical complications were reported as sometimes being more influential; these concerns were due to external factors such as practice setting including out of hours and time-pressured clinics, patient specific factors and parental pressure. All participants had been aware of parental pressure to prescribe antibiotics which they considered to be inappropriate. While experience, confidence and colleague support were helpful in resisting this pressure, most reported having prescribed antibiotics against guideline recommendations as a result of external influences [32].

Offredy and colleagues used previously validated clinical scenarios to score participants' pharmacological knowledge and data generated via semi-structured interviews were used to ascribe participants' decision-making to one of six modes according to Hammond's Cognitive Continuum Theory [41]. Participants were also asked to rate their knowledge and confidence of medication used in their area of practice and about medication-related issues. More patient contact increased participants' comfort with prescribing decision-making. Some participants indicated that the availability of extensive peer and organisational support influenced their prescribing. Participants' knowledge of pharmacology was poor; most could not respond appropriately to the scenarios but said that in general they would access the British National Formulary before making prescribing decisions. Participants who were unable to respond to

scenarios said they would refer the 'patient' to the general practitioner as the situations were outwith their experience and competence. Most participants rated themselves as confident in dealing with medication-related issues. Participants' prescribing decision-making was categorised by the researchers as involving moderately-strong or weak quasi-rational thought although the method by which this was done was not always justified.

Rowbotham and colleagues [33] studied NMPs' experiences of managing patients with self-limiting respiratory tract infections. NMPs reported that while some patients consulted seeking reassurance that their condition was not serious, others wanted (or sometimes demanded) treatment with antibiotics, generally due to a lack of understanding of the condition and/ or previous treatment with antibiotics. Consultations could be time consuming and complex and participants worried about misdiagnosis, leading to a cautious approach to prescribing decision-making. Some had prescribed antibiotics in the past in response to time pressure, adverse social circumstances and patient expectation and/or clinical uncertainty but most said that they would no longer do so. Patient education and good communication skills were considered important and peer support and the use of guidelines helpful in resisting patient pressure for antibiotics however some nurse prescribers reported conflict with GPs who prescribed antibiotics after a 'no antibiotic' decision by the nurse prescriber.

DISCUSSION

This systematic review has identified a paucity of research around NMPs' prescribing decision-making with only three studies meeting the inclusion criteria. Furthermore, exploring and articulating NMPs' prescribing decision-making was not the primary aim of any of the studies reviewed. The limited evidence from this systematic review, however, suggests that NMPs perceive prescribing decision-making as challenging and complex. Experience in the role [32], the use of evidence-based guidelines [32, 33] and peer support and encouragement from doctors [40] helped participants to feel more knowledgeable and

confident about their prescribing decisions, and also to resist patient pressure for antibiotics [34]. Evidence-based guidelines were useful in helping NMPs to resist this pressure [33].

This is the first systematic review to focus on influences on prescribing decision-making by non-medical prescribers and reveals differences from what is known about medical prescribers. Transferability of review findings may be limited by small sample sizes, UK primary care settings and inclusion of almost exclusively nurse prescribers. Furthermore, all three studies focused on prescribing decision-making for acute conditions and hence the findings are not necessarily transferable to decision-making for patients with chronic conditions or instances of multimorbidity.

Only a small number of NMP studies were available for inclusion within this systematic review, however it is evident from these and research involving prescribing within the medical field that prescribing decision-making is complex and influenced by many factors, some of which may be contradictory and complicate further decision-making. This complexity aligns to the step-wise process of hypothesis development and testing described by Newell and Simon [16]. At this stage, in view of the small number of studies the influences identified among NMPs should be interpreted and utilised with caution. It is vital that more high quality research is carried out to explore them further. One limitation of the studies in this review is that none described fully the process of decision-making leading to the development of a prescribing plan with subsequent evaluation and solution definition. Notably, none of the studies identified as paramount the key social and cognitive influences which have been described for medical prescribers, among whom the doctor-patient relationship and perceived patient/ parental pressure were found to be highly influential [20, 21, 22, 25, 42, 43, 44, 45, 46, 47]. However, among NMP prevalent influences were clinical uncertainty including potential risk of development of complications, patient expectations, time pressures and peer support.

Algorithms, in the form of evidence based guidelines, influenced prescribing decision-making by non-medical prescribers and were perceived to offer rigorous, clear guidance on treatment and selection of antibiotics for otitis media and respiratory tract infections [32, 33]. While most participants claimed to follow such guidelines, some more experienced NMPs described a more heuristic approach to management during which they had chosen to ignore guidelines, and sometimes practice policy, and prescribe antibiotics in response to clinical uncertainty and perceived risk of complications [32, 33]. They also prescribed antibiotics in response to external factors such as previous experience, perceived patient pressure for antibiotics, patients' socio-economic status and prescriber's knowledge of the patient or family [32, 33]. Prescribing decision-making for self-limiting infections can also be challenging for medical prescribers and there is wide variation in antibiotic prescribing [48]. Antibiotic stewardship is a key public health concern world-wide [49]; it is important that all prescribers follow best practice in this area yet there is ample evidence that this is not happening with potentially serious implications for the future [50, 51].

The heuristic approach was also apparent in relation to NMPs relying on intuition and experience when responding to clinical scenarios, rather than on up to date pharmacological knowledge. Offredy and colleagues identified poor knowledge despite participants claiming knowledge of medicines used in their own clinical areas. [40]. Others have highlighted that practising NMPs have identified a need for continuing professional development in the area of pharmacology and drug interactions [52].

The context within which prescribing occurred was important in influencing prescribing decision-making; a team approach to prescribing with peer support and encouragement from doctors helped to build participants' confidence [40] and helped them to resist patient pressure to prescribe [32, 33].

Further research on NMPs' decision-making processes is warranted using qualitative approaches such as interviews and focus groups with rigour to provide trustworthiness and transferable findings. Quantitative methodologies such as widely-disseminated questionnaires should provide generalisable results around the extent of cognitive and social issues which could inform education and training. There is also a need to explore the impact of these on prescribing decisions made and the clinical implications, perhaps through case studies.

In conclusion, this high quality systematic review shows that while there is a limited quality evidence base on NMPs' prescribing decision-making, from the small number of studies it appears that the complexity identified in medical studies may be mirrored among NMPs. More research is required further to explore and confirm this.

DECLARATIONS:

1. ETHICAL APPROVAL: Ethical review was carried out and secured from the School of Pharmacy & Life Sciences, RGU Ethical Review Panel.
2. FUNDING: None
3. CONFLICT OF INTEREST: None

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Table 1: quality assessment of papers included in the review

Authors, year	Clear statement of aims	Qualitative methodology appropriate	Design appropriate	Recruitment strategy appropriate	Data collection appropriate	Reflexivity considered	Ethical issues considered	Rigorous data analysis	Clear statement of findings	How valuable is the research?
Philp and Winfield 2010.	Yes but only stated clearly in abstract	Yes and justified: in-depth exploration.	Partial. Semi-structured interviews; topic guide "asking mainly open-ended questions" not included	Partial. Invitation/ information letters sent via all practice managers in Cornwall. No follow up.	Partial. Setting not considered or justified; little information on topic guide; no discussion of data saturation, no underpinning theoretical framework.	Partial. No information on research team. Extent of researchers' involvement in "constructing a version of participants' world" not clear.	Partial. Good detail re obtaining consent; not clear whether oral or written. Local research ethics and research governance approval given.	Partial. Detailed description of method of analysis. May have benefitted from a theoretical framework.	Yes, also clear statement of implications. Themes with supporting quotations clearly set out.	Valuable: provides useful information on nurse prescribers' perspective; findings discussed in relation to what is known about medical prescribing.
Rowbotham *et al*. 2012.	Yes.	Yes. In-depth exploration of participants' experiences and challenges.	Partial. Interviews and focus groups but not clear why both and allocation of participants not clear. Topic guide used for	Partial. More detail needed of setting and sampling frame; recruitment not clear; one focus group part of a training intervention.	Partial. Semi-structured interviews and focus groups appropriate. No focus group topic guide; no discussion of sample size but part of a larger	Partial. No information on research team. Possibility of social desirability bias acknow-ledged but non-judgemental	Yes. NHS ethics approval received. Clear detail of procedures for obtaining informed consent and ensuring security of data.	Partial. Detailed description of method of analysis; no theoretical framework.	Yes. Themes with supporting quotations clearly set out. Focus group participants' professions not clear but over-whelmingly nurse	Valuable: recent study addressing prescribing decision-making processes of nurse and to a much lesser extent pharmacist and physio prescribers.

			interviews, no information re focus groups.		programme; no underpinning theoretical framework. Thematic saturation reached but not explained.	stance claimed and supported by participants' apparent honesty.			prescribers.	
Offredy, Kendall and Goodman 2007	No	Partial. Qualitative method appropriate for 'in-depth' understand-ing. Quantitative approaches included; appropriate to test knowledge.	Partial. Describe testing knowledge of pharma-cology then later use the more accurate term 'medication -related issues.'	Partial. Purposive sampling stated but no details.	Partial. Semi-structured interviews appropriate. Categorisation of decision-making not justified. No mention of data saturation.	No. No mention of researchers' backgrounds, stances or potential bias but participants appear to have answered honestly.	Partial. Relevant ethics approval obtained. Some aspects of data governance not clear.	Partial. Mainly quanti-tative analysis; limited elaboration of categoris-ation of responses. Unclear how data presented were selected.	Partial. Mix of nurse prescribers and trainees but source of some results not clear: quotations, categor-isation and decision-making modes not ascribed to participant type.	Reasonably so. Relatively recent study addressing prescribing decision-making processes of nurse prescribers. Claims that cognitive continuum theoretical framework can help explain these.

Table 2: data extraction summary from papers included in the review

Authors years	Aims/ objectives	Study design	Inclusion/ exclusion criteria	Recruitment	Participants/ setting	Unit of analysis	Method of analysis	Findings
Philp and Winfield 2010	Describe and explore nurse prescribers' use of evidence-based guidelines and other prescribing-related influences when treating otitis media in children.	Descriptive qualitative approach. Audio taped semi-structured in-depth interviews.	Nurse independent prescribers (n=8).	Letters sent to all primary care practice managers in Cornwall for forwarding to any nurse practitioner prescribers. No second mailing.	Nurse independent prescribers (n=8) working in primary care practices in Cornwall.	Individual semi-structured in-depth interviews (30-45 minutes, audio-taped) based on topic guide.	Thematic analysis using a framework developed iteratively from aims, objectives and transcripts.	Aware of clinical guidance but unsure of quality; didn't always follow. Contexts, situations or patient groups also influential.
Rowbotham *et al*. 2012	Explore non-medical prescribers' experiences of respiratory tract infection consultations and challenges faced in trying to implement a no-prescribing strategy.	Qualitative approach. Digitally audio-recorded semi-structured interviews (n=15) + 3 focus groups (n=5, 4 & 12).	Reported as part of a wider research programme.	Not clear. Direct contact with practices + advertising at local training events. Purposive sampling: practice location, discipline, age & scheduled/ unscheduled care setting.	Not clear. Abstract: 34 nurse prescribers+ 2 other non-medical prescribers. Paper: 31 nurse prescribers, one physio prescriber and one pharmacist prescriber (both only in focus groups). North West of England.	15 interviews (nurse prescribers only; 13-82 minutes, audio-taped). Topic guide used + interviewers responsive to emerging issues. Quotations ascribed to individuals. 3 focus groups with nurse prescribers (n=19) + one physio prescriber and one pharmacist prescriber (82-87 minutes, audio-taped). No mention of topic guide. Quotations ascribed only to focus group.	Iterative thematic analysis. Thematic saturation reached.	Consultations challenging; most participants had some appropriate communication skills to avoid antibiotic prescribing. Protocols and peer support helpful. Newness of role resulted in some caution in approach.

Offredy, Kendall and Goodman 2007	Abstract: to explore and test nurse prescribers' pharmacological knowledge & decision-making. Paper: to test the usefulness of patient scenarios in addressing the reasons why nurses decide whether or not to prescribe and how they made their prescribing decisions.	Qualitative. Semi-structured interviews (n=25) using case scenarios + self-rating of knowledge and confidence about medication used in own area of practice.	Nurse prescribers and those training as nurse prescribers employed in community/ primary care and acute settings.	Purposive sampling "…to ensure there was a mixed group of prescribers." Information sent to managers of two Primary Care Trusts (PCTs) for onward posting to all nurse prescribers and trainee nurse prescribers.	Nurse prescribers (n=18) + trainee nurse prescribers (n=7) in two PCTs in the southeast England.	Individual tape-recorded semi-structured interviews based on patient scenarios + self-rating of knowledge and confidence about medication used in own area of practice. Quotations ascribed to individuals.	Content analysis to assess participants' knowledge of medication-related issues and identify the type of cognition used in response to scenarios.	Most were unable to identify clinical issues and provide an acceptable solution. Most claimed issues were out with their competence and said they would refer to a GP. All rated themselves 'knowledgeable' about drugs commonly used in their own clinical areas; most felt confident in their own clinical areas. Most commonly used modes of decision-making were moderately strong quasi-rational thought and weak quasi-rational thought. Knowledge (or lack of it) may dictate the mode of decision-making.

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram

(from Moher, D, Liberati, A, Tetzlaff, J, Altman DG, The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med.* 2009; **151**(4):264-269.)