Non-medical prescribing behaviour in midwifery practice: a mixed-methods review

***Yvonne Fontein-Kuipers**[1] PhD, PgDHE, MSc, RM. **Miek Brouns**[2] MSc, RM. **Els Driessen**[3] MSc, RM. **Eveline Mestdagh**[4] PhD, MSc, RM. **Professor Bart Van Rompaey**[5] PhD RN.*

1. Senior research fellow, Antwerp University, Faculty of Medicine and Health Sciences – Nursing and Midwifery, Campus Drie Eiken, Universiteitsplein 1, 2610 Antwerp, Belgium. Email: yvonne.fontein-kuipers@ap.be
2. Midwifery lecturer, Artesis Plantijn University College Antwerp, Midwifery Department, Noorderplaats 2, 2000 Antwerp, Belgium. Email: miek.brouns@ap.be
3. Midwifery lecturer, Artesis Plantijn University College Antwerp, Midwifery Department, Noorderplaats 2, 2000 Antwerp, Belgium. Email: els.driessen@ap.be
4. Head of midwifery education, Artesis Plantijn University College Antwerp, Midwifery Department, Noorderplaats 2, 2000 Antwerp, Belgium. Email: eveline.mestdagh@ap.be
5. Professor of Nursing & Midwifery Sciences, Antwerp University, Faculty of Medicine and Health Sciences – Nursing and Midwifery, Campus Drie Eiken, Universiteitsplein 1, 2610 Antwerp, Belgium. Email: bart.vanrompaey@uantwerpen.be

Funding: The study was a practice-orientated scientific research (PWO-3105R2005) project funded by the Department of Economy, Science and Innovation of the Flemish Government.

Date submitted: 23/09/2018 **Date accepted:** 08/02/2019 **Date published:** 28/03/2019 **Date open access:** 28/06/2019

Abstract

Background. Non-medical prescribing is a new skill in midwifery practice. Information is needed on whether this is an activity that is feasible, appropriate, meaningful and effective.

Aim. To report on the determinants of midwife prescribing behaviour to inform midwifery practice.

Method. A mixed-methods review using an integrated approach combining methodologically diverse data into a single mixed-methods synthesis. A systematic search of the literature was conducted. Data were categorised according the feasibility-appropriateness-meaningfulness-effectiveness (FAME) scale and thematised according the attitude, social-influence, self-efficacy (ASE) model. A thematic analysis, a Bayesian descriptive analysis and Bayesian Pearson correlations of the FAME-categories and ASE-themes were performed.

Findings. Seven studies showing moderate to good quality were included for synthesis. The FAME categories feasibility and appropriateness tended to affect the utility of midwife prescribing; meaningfulness and effectiveness were related to non-utility of prescribing. There were weak to moderate correlations between the FAME categories and the ASE themes social influence, intention, barriers and supportive factors and perceived knowledge (r-.41 to -.34 and r.37 to .56). ASE themes showed a strong negative correlation between attitude and self-efficacy (r-.70); weak positive correlations between attitude and social influence (r.31) and perceived knowledge (r.30); a weak positive correlation between self-efficacy and social influence (r.30), and a weak negative correlation with intention (r-.31); a moderate negative correlation between social influence and barriers/ supportive factors (r-.50); a weak negative correlation between barriers/supportive factors and perceived knowledge (r-.38).

Conclusion. Prescribing fits the midwife's professional role and maternity services and is enhanced by the midwife's willingness and supportive practice. Prescribing requires collaborative practice, meaningful relationships with women, (applied) knowledge, expertise, and theoretical, practical and logistic support in the clinical area.

Implications. Midwives who consider prescribing or who are autonomous prescribers should be aware of their role and position as autonomous prescriber. They should reflect on their willingness to prescribe, self-efficacy, perceived knowledge, their cognitive beliefs about prescribing and the effect of prescribing on women in their care.

Key words: Behaviour, midwifery, mixed-methods review, non-medical prescribing, evidence-based midwifery

Introduction

The role and responsibilities of midwives have undergone tremendous transformation in recent years. One key development has been the implementation of independent non-medical prescribing by midwifery practitioners across many countries (Facq et al, 2018; Stewart et al, 2012; Hunter and Eddy, 2011; Hawkes, 2009). Non-medical prescribing means that a health professional who is not a doctor (e.g. the midwife), prescribes medication within the field of expertise of that health professional. Given the evidence, there is great potential for non-medical prescribers to impact positively on patient care and safety (Cope et al, 2016; Drennan et al, 2009; Courtenay and Carey, 2007).

Evaluating midwife prescribing in practice, can be carried out from several perspectives: change management, learning processes of midwives and creating awareness to increase the adaptation capacity of prescribing in midwifery practice and education (Barkimer, 2016; Bayes et al, 2016). This requires an exploration of the potential factors that can play a role in implementation, transition and evaluation processes of midwife prescribing. In nursing, behavioural factors are strongly associated with prescribing (Sulosaari et al, 2012), suggesting that behavioural responses should not be neglected in understanding midwife prescribing. Midwives' behaviour is the fundamental level for transition towards fully implemented and sustained prescribing in midwifery practice. Midwives' behaviour is therefore worth exploring to arrive at a synthesis of what is known and what needs to be known about the determinants of their prescribing behaviour. So far, there are no records that specifically focus on the utility of behavioural aspects of midwife prescribing, although we have a sound belief that aspects such as intention, attitude and self-efficacy

affect the management of midwifery care (Fontein-Kuipers et al, 2016; Merkx et al, 2015; Fontein-Kuipers et al, 2014).

Midwives, those who already have implemented non-medical prescribing as well as those who are scoping prescribing practices, but also midwifery managers and educators, would benefit from evidence on midwife prescribing. In particular, information is needed as to whether this is an activity that is practical, appropriate and feasible in midwifery practice, if it relates to values, thoughts and opinions of childbearing women, and if it contributes to clinical and/or health outcomes, including satisfaction of care.

Aim

This paper aims to facilitate the understanding and synthesis of midwives' autonomous prescribing, focusing on the process as it is currently conceived, purported and practised. To achieve this, we (i) investigated the behavioural determinants of midwives on the utility of their autonomous prescribing; (ii) provided a template for a multi-factorial model; (iii) made reasonable estimates of the known prescribing behavioural aspects of midwives. To obtain a collective conceptual clarity around prescribing behaviour, we sought an answer to the following question: what are the determinants of midwife prescribing behaviour?

Methods

Design

A mixed-methods review was performed using an integrated methodology combining data derived from methodologically different studies into a single mixed-methods synthesis (Sandelowski et al, 2006). The approach taken involved a thematic synthesis and the analysis of relationships between and within studies (Pearson et al, 2005). We used the feasibility-appropriateness-meaningfulness-effectiveness (FAME) scale, to organise information. Feasibility is about whether a certain behaviour is physically, culturally or financially practical or possible within a given context (Pearson et al, 2005). Appropriateness is about how certain behaviour relates to the context in which care is given (Pearson et al, 2005). Meaningfulness relates to the personal experience, opinions, values, thoughts, beliefs and interpretations of women and their families (Pearson et al, 2005). Effectiveness is about the relationship between a certain behaviour and clinical or health outcomes, including satisfaction (Pearson et al, 2005).

To determine the behavioural determinants of prescribing among midwives, we chose the attitude, social-influence, self-efficacy (ASE) model to structure the themes. According to this model, behaviour can be explained by several factors. Firstly, intention or the willingness to perform a certain behaviour. Secondly, attitude as the degree to which an individual has a (un)favourable evaluation of the behaviour in question. Thirdly, social influences or perceived expectations of self, others, social norm and social pressure, and support. Fourthly, perceived self-efficacy, being the ease, confidence or difficulty to perform a task related to the desired behaviour. In addition to these, behavioural factors such as perceived knowledge and barriers can play a role (de Vries et al, 2000; de Vries 1993). The ASE-model is widely used to explain health professionals' behaviour (Eccles et al, 2012; Bartholomew et al, 2011; Schellart et al, 2011; de Vries et al, 2000), including that of midwives (Fontein-Kuipers et al, 2016; Merkx et al, 2015).

Search strategy and selection

To ensure a high degree of subject specificity and to contribute to a unique perspective of the understanding of midwife prescribing, relevant sources had to include literature of midwifery, healthcare, healthcare education and social sciences. A 10-year limit was placed on publication dates as implementation of midwife prescribing is a fairly new task within the midwifery profession of which the uptake has been rather slow (Facq et al, 2018; McIntosh et al, 2016; Drennan et al, 2009), thus anticipating some delay in research and/or dissemination of study findings. Primary peer-reviewed research studies with samples of midwives, irrespective of country or region, years of working experience or practice setting were included.

We included:

- Records of midwives on post-graduation non-medical prescribing courses
- Studies that reported on the experiences of key stakeholders such as childbearing women, medical staff, pharmacists, non-medical educators and clinical managers related to midwifery
- Records that studied midwife prescribing during preconception care, antenatal, intrapartum and postnatal care, during menopause management and neonatal care.

We excluded:

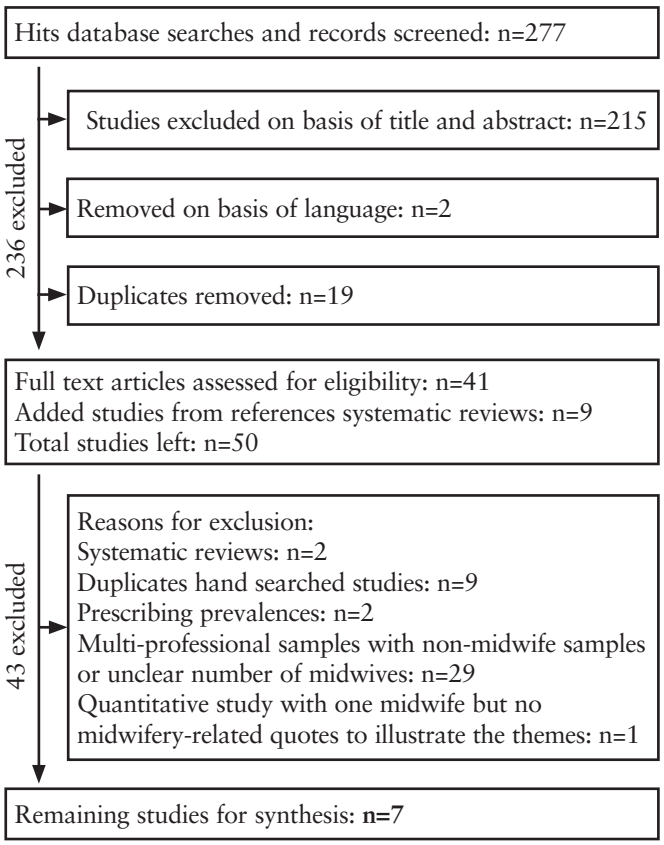
- Studies with a single focus on prescribing prevalences by midwives, including prevalences of (types of) drugs
- Studies related to prescribing for specific illnesses/medical conditions/disabilities, allergies, substance abuse, nicotine replacement, oxygen or studies solely focusing on (foetal) teratogenic risks
- Historical studies, guidelines, study protocols
- Studies focusing on teaching strategies and assessment of pharmacological knowledge and application
- Studies that contained multidisciplinary samples with an unclear number of midwives
- Studies that involved non-medical self-medication, i.e. complementary/alternative medication, homeopathy and over-the-counter available medication.

Three researchers independently searched the electronic databases PubMed, Medline, Discovery Search (EBSCO), CINAHL (Nursing & Allied Health Collection), OVID and Google Scholar. Systematic reviews were excluded for synthesis since the focus was on original data. To retrieve primary studies, reference lists of reviews were scanned and hand searched. The searches were performed between 11 December 2017 and 20 June 2018.

Data abstraction

The initial search identified 277 research entries. Two researchers independently scanned titles and abstracts for a clear relevance to midwife prescribing and removed the duplicates. The selection was narrowed down to 41 articles that were scrutinised in full text. After further assessment,

Figure 1. Flow chart



seven studies remained (Figure 1). Two researchers independently read the full texts to extract ASE-related sentences and phrases and to assess study quality. Similar ASE-variables were grouped together. For example, motivation and intention were considered as one theme called 'intention'; work setting, regulatory issues and education were combined into one factor called 'barriers and supportive factors'; social influence, social norm and collegial support, were combined into 'social influence'. Six themes emerged: attitude, self-efficacy, social influence, intention, barriers and supportive factors, and perceived knowledge – reflecting the behavioural determinants of the ASE model (Bartholomew et al, 2011; de Vries et al, 2000; de Vries, 1993). The Cochrane Centre checklists were used to assess the methodological quality of the studies (Cochrane, 2018). Once the data were extracted from the qualitative and quantitative reports, variables were grouped into ASE themes. The ASE themes were subsequently ordered in the FAME scale. Findings were compared and discussed among all researchers, reaching consensus.

Data analysis

Bayesian estimation was applied for synthesis of data that allowed the methodological diverse evidence to affect the results in the same way, producing predictive optimality of the probability in the estimate of the variables (van de Schoot et al, 2015). Subject-level quantitative information was extracted and translated into the numerical results. This meant that information about finding frequencies were transformed from verbal counts (e.g. few, many, strongly, neither/nor, major, not at all) into numbers. All data was thematically synthesised and codified for each ASE variable based on whether the variable affected prescribing behaviour, categorised in: 'clearly present', 'tendency' and 'not present'. For the quantitative data p-values and applied criteria were used such that if p .001 to p .05, it was coded as 1; p> .05 to p .10, as 0.5; and p> .10, as 0. We used Kappa values: .61 to .80 was coded as 1; .42 to .60, as 0.5; and <.20 to .41, as 0. The method allowed for the same treatment of quantitative and qualitative reports (Crandell et al, 2011; Pearson et al, 2011; Stuijt et al, 2009; Voils et al, 2009). A data matrix was created in Excel, with codified variables of all of the reports, with each column corresponding to one of the selected ASE themes and the rows to a FAME category. Entries were made in the matrix whenever the feasibility, appropriateness, meaningfulness and effectiveness of a prescribing ASE theme was reported as promoting utility of prescribing behaviour (1), having no effect on utility (0.5), or not promoting the utility of prescribing behaviour (0). If a report did not address a certain theme, the cell was left blank. For analysis, the Excel data file was exported into SPSS version 25.0.

Multiple imputation was used for the missing values in order to analyse the complete data set (Ma and Chen, 2018). Posterior point estimates and the credible intervals for the means to estimate the association between the variables and utility/non-utility were examined. An interval containing below 0.25 indicated non-utility of prescribing behaviour, between 0.25 and 0.5 indicated a tendency to prescribing behaviour; credible intervals with values of >0.5 were associated with utility of prescribing behaviour (Crandell et al, 2011). Bayesian Pearson correlations were calculated to establish the strength of the relationship between: the FAME categories and the ASE themes, and the ASE-themes. Non-informative priors (c=1) were used, as there were no prior distributions to regularise the beliefs according to midwife prescribing (Berger, 2001). Midwifery is a distinct profession, with a different scope and role description compared to other healthcare professionals (Sinclair, 2006). Therefore, data from other professions were not used for prior distributions as they were found to be irrelevant (van de Schoot et al, 2015; Voils et al, 2009).

Results

Sample characteristics

The final sample of seven studies were published between 2009 and 2016 and originated from Europe, specificially the Republic of Ireland, UK (Scotland) and Switzerland (Csajka et al, 2014; Boreham et al, 2013; Naughton et al, 2013; Drennan et al, 2011), the US (Hastings-Tolsma et al, 2009), Australia (Small et al, 2016) and China (Han et al, 2017). Four studies used a survey to collect data (Small et al, 2016; Csajka et al, 2014; Drennan et al, 2011; Hastings-Tolsma et al, 2009), of which two studies included open categories (Small et al, 2016; Drennan et al, 2011). One study used a mixed-methods approach with triangulation of data from questionnaires, focus groups and interviews (Boreham et al, 2013). We included one Delphi-study (Han et al, 2017) and one multi-site documentation evaluation (Naughton et al, 2013). Collectively the studies had a total of 646 midwives and 70 stakeholders (women, physicians, pharmacists, educators) in their analyses.

Midwives were either employed or self-employed, practised in hospital and/or community settings, covering the antenatal, intrapartum and postpartum periods. Two studies contained midwives that also worked in family planning services (Boreham et al, 2013; Hastings-Tolsma et al, 2009) and one study included midwives that also provided menopausal and neonatal care (Hastings-Tolsma et al, 2009). Two studies reported on the fact that their sample included midwives who had reached the step of prescribing and midwives who had not (Small et al, 2016; Hastings-Tolsma et al, 2009). One study included midwives who were undertaking the non-medical prescribing course at the time of study (Boreham et al, 2013). Three studies provided information on ages and years of work experience (Small et al, 2016; Boreham et al, 2013; Hastings-Tolsma et al, 2009). The overall quality of the studies showed a moderate (Han et al, 2017; Boreham et al, 2013) to good quality (Small et al, 2016; Csajka et al, 2014; Naughton et al, 2013; Drennan et al, 2011; Hastings-Tolsma et al, 2009).

Thematic findings, FAME categories

The feasibility of midwifery prescribing very much depended on formal regulation and legislation of midwife prescribing, and appointing and authorising midwives as non-medical prescribers (Hastings-Tolsma et al, 2009; Naughton et al, 2013; Csajka et al, 2014; Small et al, 2016; Han et al, 2017). Midwife prescribing was regarded as appropriate when this aligned with the autonomous character of the midwife's role and when distinction was made between prescribing in physiological and in (complex) medical cases and situations – requiring different protocols and different levels of multidisciplinary collaboration (Han et al, 2017; Boreham et al, 2013; Hastings-Tolsma et al, 2009). Prescribing was meaningful when women's care needs were met and when it contributed to the care satisfaction of childbearing women (Drennan et al, 2011; Boreham et al, 2013). By meeting the needs of women and their babies, delivering quality of care, correct and relevant medication choices and thus effective usage, prescribing resulted in increased midwives' job satisfaction (Han et al, 2017; Small et al, 2016; Boreham et al, 2013; Naughton et al, 2013).

Thematic findings, ASE themes

Attitude: midwives' attitudes towards prescribing had mainly a cognitive character – they held strong rational beliefs to be(come) a competent non-medical prescriber (Small et al, 2016; Boreham et al, 2013; Hastings-Tolsma et al, 2009). Prescribing enhanced the midwife's sense of autonomous practice and professionalism and contributed to job satisfaction (Han et al, 2017; Csajka et al, 2014; Boreham et al, 2013; Naughton et al, 2013; Hastings-Tolsma et al, 2009). Midwives were aware of the responsibility and liability associated with prescribing (Csajka et al, 2014). Women and other healthcare professionals also reported a positive attitude towards midwife prescribing (Han et al, 2017; Drennan et al, 2011).

Self-efficacy: midwives felt able and confident to prescribe autonomously (Small et al, 2016; Boreham et al, 2013).

Social influence: support of colleagues (Small et al, 2016) and their national association of midwives, and being recognised by hospital staff and pharmacists as independent prescribers, encouraged midwife prescribing (Hastings-Tolsma et al, 2009). Midwives reported that prescribing enhanced collaborative practice and positive working relationships (Boreham et al, 2013). Midwives felt the influence of relayed negative media news reports that related to midwife prescribing (Csajka et al, 2014). They reported that physicians' or pharmacists' negative attitudes, or procedures such as peer review/audits, did not affect their prescribing behaviour (Small et al, 2016; Hastings-Tolsma et al, 2009).

Intention: midwives reported high intentional levels of prescribing (Small et al, 2016). Their intention to uptake prescribing (courses) was reinforced by feeling supported on the work floor (Boreham et al, 2013; Hastings-Tolsma et al, 2009). When women reported satisfaction with midwife prescribing and complied with taking the prescribed medication, this enhanced and sustained the midwife's motivation to prescribe or the intention to uptake prescribing (Drennan et al, 2011).

Barriers and supportive factors: the most important supportive factor to prescribe was the legislative change, i.e. the regulation in itself (Small et al, 2016). Inherent reported barriers were the regulatory process to become an authorised non-medical prescriber (Small et al, 2016). Having systematic pharmacological knowledge and hands-on experience, i.e. the opportunity to translate acquired knowledge into practice, supported prescribing (Small et al, 2016; Boreham et al, 2013; Hastings-Tolsma et al, 2009). Support, or a lack of support, in the clinical area (e.g. mentorship, supervision) and (a lack of) logistic and practical support (e.g. time, guidelines, malpractice insurance), were perceived as barriers as well as supportive factors (Boreham et al, 2013; Hastings-Tolsma et al, 2009).

Perceived knowledge: midwives reported how they applied their knowledge into practice, making appropriate and correct choices for medication, correct dosage, frequency and timing (Small et al, 2016; Naughton et al, 2013; Drennnan et al, 2011). Midwives accessed prescribing reference material (i.e. literature, practice guidelines) to validate their advice given to women (Han et al, 2017; Csajka et al, 2014; Drennan et al, 2011; Hastings-Tolsma et al, 2009).

Numerical findings, FAME-categories and ASE-themes

With regard to the FAME-categories, most of the studies reported on the feasibility, appropriateness and effectiveness of midwife prescribing, and to a lesser extent on meaningfulness. As shown in Table 1, a large proportion of cells contain no data. Missing values were imputed using the Markov Chain Monte Carlo (MCMC) method, as the missing values showed a non-monotonic pattern. The criteria for the Bayesian analysis were set at a number of 10.000 Monte Carlo samples, a maximum of 2000 iterations and a tolerance of 0.0001.

Based on the credible intervals of the FAME categories, feasibility (.27) and appropriateness (.28) showed a tendency towards affecting the utility of midwife prescribing, while meaningfulness (.17) and effectiveness (.18) were related to non-utility of prescribing (Table 2). With regard to the ASE themes, most studies reported on attitude and least on self-efficacy. The credible intervals of the ASE themes showed that attitude (.32) and social influence (.33) showed a tendency

Table 1. Data matrix relating the FAME categories and ASE themes

		ASE themes					
Fame Categories	**Study**	**Attitude**	**Self-efficacy**	**Social influence**	**Intention**	**Barriers and supporting factors**	**Perceived knowledge**
Feasibility	Han et al (2017)	1 0.5		1		1	
	Small et al (2016)	0.5		1 0 0		0.5 0.5 0.5 0.5 1	
	Csajka et al (2014)	1		1			
	Boreham et al (2013)				0.5		
	Naughton et al (2013)	1					
	Hastings-Tolsma et al (2009)	0.5				0.5	
Appropriateness	Han et al (2017)					1	
	Small et al (2016)		0.5 0		1		1
	Csajka et al (2014)	1					1
	Boreham et al (2013)	1	1	1	1		
	Hastings-Tolsma et al (2009)	0		0.5 0 1 1	1 1 1	1	
Meaningfulness	Boreham et al (2013)	0.5 0.5					
	Drennan et al (2011)	1					1
Effectiveness	Han et al (2017)	0.5 0.5 0.5					
	Small et al (2016)	1 1 1					
	Boreham et al (2013)		1	1			1 1
	Naughton et al (2013)						1 0.5
	Drennan et al (2011)	1			1		
	Hastings-Tolsma et al (2009)	1					

towards affecting the utility of midwife prescribing, while self-efficacy (.19), intention (.18), barriers and supporting factors (.16), and perceived knowledge (.18) were related to non-utility of prescribing (see Table 2, overleaf).

There was a moderate positive correlation between feasibility and barriers/supporting factors (r= .56), a weak positive correlation between appropriateness and social influence (r = .37), a moderate positive correlation between appropriateness and intention (r= .42) and a moderate negative correlation between appropriateness and perceived knowledge (r= -.44). There was a weak positive correlation between meaningfulness and intention (r= .37), a moderate positive correlation between meaningfulness and social influence (r= .46) and a moderate negative correlation between meaningfulness and perceived knowledge (r= -.41). There were moderate positive correlations between effectiveness and social influence (r = .50) and intention (r= .50) and a weak negative correlation between effectiveness and barriers/supportive factors (r= -.34). There was a strong negative correlation between attitude and self-efficacy (r= -.70) and weak positive correlations between attitude and social influence (r= .31) and perceived knowledge (r= .30). Self-efficacy showed a weak positive correlation with social influence (r = .30) and a weak negative correlation with intention (r= -.31). There was a moderate negative correlation between social influence and barriers / supportive factors (r = -.50) and a weak negative correlation between barriers /supportive factors and perceived knowledge (r= -.38) (see Figure 2, overleaf).

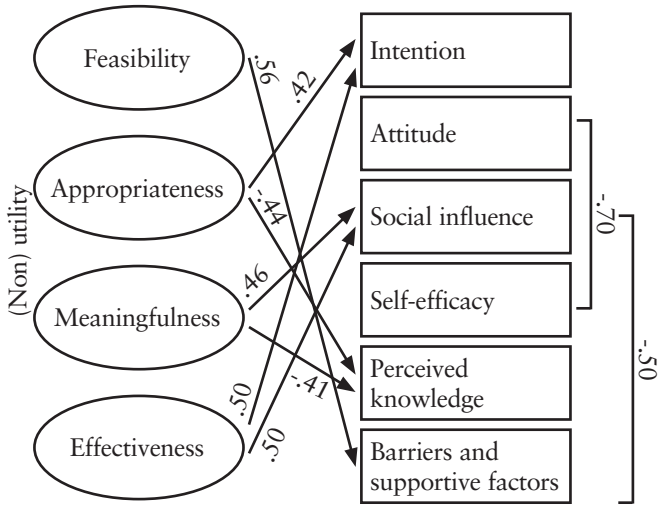
Discussion

Based on the synthesis and the modelling of the ASE themes and FAME categories, this study showed that midwife prescribing depends on various factors. The interplay between the various

Table 2 Reports of FAME categories and ASE themes

	Number of entries	Posterior mean (95% credible interval)
FAME categories		
Feasibility	19	.70 (.56 to .83)
Appropriateness	20	.73 (.59 to .87)
Meaningfulness	4	.65 (.57 to .74)
Effectiveness	15	.71 (.62 to .80)
ASE themes		
Attitude	20	.44 (.28 to .60)
Self-efficacy	4	.74 (.65 to .84)
Social influence	11	.67 (.50 to .83)
Intention	7	.71 (.62 to .80)
Barriers and supporting factors	9	.62 (.54 to .70)
Perceived knowledge	7	.80 (.71 to .89)

Figure 2. Moderate and strong Bayesian correlations (r) of FAME categories and ASE themes



aspects were disentangled. To the best of our knowledge, this has not been done before in such a methodological way.

Midwife prescribing seems to be feasible and appropriate in a supportive culture of midwifery practice at micro level (e.g. workplace), meso level (e.g. hospital policies) and macro level (e.g. professional organisation of midwives). The sample in this study consisted of midwives who practised in various settings and in different forms of employment. The specific workplace environment and prevailing culture of the maternity setting are known to influence prescribing attitude and subsequent prescribing behaviour (Hall et al, 2013). This might be related to midwives' perceived importance of the social norm and expectations as conveyed by their colleagues (Fontein-Kuipers et al, 2018). With regard to meso and macro level, midwives are part of a wider and integral healthcare and professional maternity care network (Perdok et al, 2016) and need to be recognised as key players in non-medical prescribing. According to the findings of this study, a positive work environment and culture seem profound prerequisites of midwife prescribing. A safe, supportive and multidisciplinary culture in which they operate could strengthen midwives' intention to prescribe. Although the midwives in this study had positive attitudes towards prescribing, it cannot be assumed that their positive views will translate into advocacy of prescribing in practice. This might be over-simplistic and failing to appreciate the impact of contextual conditions.

Meaningfulness and effectiveness were not fully addressed in this study, hence none of the FAME categories showed high utility. This seems logical as prescribing is a rather novel extension of the midwife's role and responsibilities, not yet being performed by a large number of midwives (Facq et al, 2018; McIntosh et al, 2016; Drennan et al, 2009). This acknowledges the need for further research but also the need to inform and educate midwives and other stakeholders about the feasibility and appropriateness of midwife prescribing to make it meaningful and effective. Therefore, the relation between meaningfulness and effectiveness, and the utility of midwife prescribing, needs to be explored more closely but also needs to be endorsed in practice.

Self-efficacy seems to be a crucial behavioural factor but is hardly addressed in this study. Self-efficacy is appointed as an influential factor to attitude (Silva, 2006), which could consequently lead to prescribing. Our findings show a strong negative correlation between attitude and self-efficacy, which can be the result of the heterogeneity of our sample, including prescribing midwives, non-prescribers, those who were in the process of becoming prescribers, and non-midwife stakeholders. The varying levels of professional competency could have affected the attitude towards prescribing, resulting in differences in self-efficacy beliefs. This implies that for midwives to uptake prescribing or to start a prescribing course, they need to be confident about their abilities and professional role, albeit that confidence of midwives grows and develops over time, and competence grows with experience (Bäck et al, 2017). Practices that enhance the attitude and self-efficacy of midwives in prescribing are likely to positively change the relationship between attitude and self-efficacy. The fact that there was no evidence of relations between attitude, self-efficacy and the FAME categories, as well as weak correlations with other ASE themes, gives rise to the thought that there might be other or unknown variables that affect the relationship between the utility of midwife prescribing and their attitude and self-efficacy. The positive attitudes of the midwives in the study towards prescribing did not translate into self-efficacy of prescribing in practice but this could have been caused by the discrepancy between the number of attitude and self-efficacy entries, as shown in Table 2. Defining the source of midwives' low self-efficacy will contribute to the utility of prescribing. Further research is warranted.

The negative correlation between social influences and the barriers and supportive factors are also likely to be a result of the heterogeneity of our sample that represents

different levels of adoption of prescribing. Adoption is more likely to happen when different members of the maternity community (managers, educators and midwives) share purposes, ownership and values, and when all members of the community see midwives as actors who can bring about change in the midwife's role in prescribing.

Limitations

Although there was a limited quantity of data, the studies showed overall good quality. There were no studies available that focused specifically on independent midwife prescribing behaviour and its determinants, explaining the fact that probabilities were represented here, this being consistent with Bayesian estimation (Crandell et al, 2011; Voils et al, 2009). We aim to estimate how likely the evidence from our included studies would be. We did not include prior knowledge, which can be regarded as a flaw of our study. Our findings are therefore informed primarily by the observed data used to construct the likelihood (van de Schoot et al, 2015). Imputation of the missing data could have introduced bias. However, the use of MCMC algorithm and the prior distribution contributed to lessen the loss of precision – that is, measurement error allowing unbiased and valid inferences (Sterne et al, 2009). We need more research on midwife prescribing to perform an analysis with use of informative priors to improve the robustness of the estimates (Ma and Chen, 2018).

We did not look at the variations between countries regarding possible differences in education: training, the midwife's scope of practice or lists of medicines that midwives are allowed to prescribe. International variations might have affected the findings of this study. Not all of the studies provided midwives' characteristics such as age, years of work experience and educational background. These aspects might have influenced the findings. It can be recommended to consider these aspects for future research.

The ASE model is one of the models commonly used in predicting and explaining behaviour in healthcare contexts (Eccles et al, 2012), albeit that prescribing behaviour-focused ASE evidence does not exist. Due to number of blank cells in Table 1, we cannot be sure of the fit and the strength of the ASE model in explaining midwife prescribing. This can easily be clarified by the limited amount of data that could be included for synthesis. Despite the limitations, we regard this study as a first attempt to explain novice prescribing behaviour to be used for future expansion when more data on the topic becomes available. The ASE model is regarded to be well suited for this purpose as it applies direct measurement of attitudes, social influence and self-efficacy (Eccles et al, 2012). Building on the same theoretical model can therefore be recommended.

Conclusion

Non-medical prescribing fits the midwife's professional role and maternity services, enhancing the midwife's autonomy, job satisfaction, confidence and collaborative practice. The findings of the study indicated that midwives' prescribing behaviour is merely mediated by the context and culture of their profession. Prescribing requires (applied) knowledge, meaningful relationships with women, hands-on experience and theoretical, practical and logistic support in the clinical area. Considering the determinants of midwife prescribing that have been identified to influence the utility of midwives' prescribing might benefit implementation, transition and evaluation processes in midwifery practice and education. The use of an operational model including the FAME categories and ASE themes, as well as the findings of this study, offer opportunities for future research.

Implications

For midwives who consider prescribing, who are on prescribing courses or who are already autonomous prescribers, it is important to understand the complexity of prescribing behaviour and how this correlates with (non) utility of prescribing.

Midwives, prescribing and non-prescribing, should be aware of their role and position as autonomous prescriber and the effect that prescribing has on women and their children. As midwives are reflective practitioners, the findings of this study offer the opportunity to question one's own willingness to prescribe, capabilities, self-efficacy, cognitive beliefs and the perceived level and content knowledge of prescribing. This study also offers topics for discussion for midwifery education and lifelong learning.

References

Bäck L, Hildingsson I, Sjöqvist C, Karlström A. (2017) Developing competence and confidence in midwifery-focus groups with Swedish midwives. *Women and Birth* **30**: e32-8.

Barkimer J. (2016) Clinical growth: an evolutionary concept analysis. *Advances in Nursing Science* **39**(**3**): e28-39.

Bartholomew L, Parcel G, Kok G, Gottlieb N, Fernandez M. (2011) *Planning health promotion programs. An intervention mapping approach* (3rd edition). Jossey-Bass: San Francisco.

Bayes S, Fenwick J, Jennings D. (2016) Readiness for practice change: evaluation of a tool for the Australian midwifery context. *Woman and Birth* **29**: 240-4.

Berger J. (2001) *Bayesian and conditional frequentist hypothesis testing and model selection.* VIII C.L.A.P.E.M: La Habana, Cuba.

Boreham N, Coull AF, Murray ID, Turner-Halliday F, Watterson AE. (2013) Education programmes preparing independent prescribers in Scotland: an evaluation. *Nurse Education Today* **33**: 321-6.

Cochrane. (2018). Beoordelingsformulieren en andere download [Cochrane checklists and other downloads]. Utrecht, Netherlands: Cochrane Netherlands. See: netherlands.cochrane.org/beoordelingsformulieren-en-andere-downloads (accessed 28 March 2018)

Cope LC, Abuzour AS, Tully MP. (2016) Nonmedical prescribing: where are we now? *Therapeutic Advances in Drug Safety* **7**(**4**): 165-72.

Courtenay M, Carey N. (2007) Nurse independent prescribing and nurse supplementary prescribing practice: national survey. *Journal of Advanced Nursing* **61**(**3**): 291-9.

References continued

Crandell JL, Voils CI, Chang Y-K, Sandelowski M. (2011) Bayesian data augmentation methods for the synthesis of qualitative and quantitative research findings. *Qual Quant* **45**: 653-69.

Csajka C, Jaquet A, Winterfeld U, Meyer Y, Einarson A, Panchaud A. (2014) Risk perception by healthcare professionals related to drug use during pregnancy: a Swiss survey. *Swiss Medical Weekly* **144**: w13936.

Drennan J, Naughton C, Allen D, Hyde A, O'Boyle K, Felle B, Treacy M, Butler M. (2009) *National independent evaluation of the nurse and midwife prescribing initiative*. University College Dublin: Dublin.

Drennan J, Naughton C, Allen D, Hyde A, O'Boyle K, Felle B, Treacy M, Butler M. (2011) Patients' level of satisfaction and self-reports of intention to comply following consultation with nurses and midwives with prescriptive authority: a cross-sectional survey. *International Journal of Nursing Studies* **48**: 808-17.

Eccles M, Grimshaw JM, MacLennan G, Bonetti D, Glidewell L, Pitts NB, Steen N, Thomas R, Walker A, Johnston M. (2012) Explaining clinical behaviors using multiple theoretical models. *Implementation Science* **7**: 99.

Facq E, Martinet W, De Loof H. (2018) Het voorschrijfrecht voor vroedkundigen in België; een stand van zaken na twee jaar [Prescribing legislative authority for Belgian midwives; state of play after two years]. *Farmaceutisch Tijdschrift voor België* **98(1)**: 18-25.

Fontein-Kuipers Y, Budé L, Ausems M, de Vries R, Nieuwenhuijze M. (2014) Dutch midwives' behavioural intentions of antenatal management of maternal distress and factors influencing these intentions: An exploratory survey. *Midwifery* **30(2)**: 234-41.

Fontein-Kuipers Y, Boele A, Stuij C. (2016) Midwives' perceptions of influences on their behaviour of woman-centered care: a qualitative study. *Frontiers in Women's Health* **1(2)**: 20-6.

Fontein-Kuipers Y, den Hartog-van Veen H, Klop L, Zondag L. (2018) Conflicting values experienced by Dutch midwives – Dilemmas of loyalty, responsibility and selfhood. *Clinical Research in Obstetrics and Gynecology* **1(1)**: 1-12.

Hall HG, McKenna LG, Griffiths DL. (2013) Contextual factors that mediate midwives' behaviour towards pregnant women's use of complementary and alternative medicine. *European Journal of Integrative Medicine* **5**: 68-74.

Han S, Zhu R, Cheng J, Yue X. (2017) Re-discussing the content of the prescription rights of midwives under certain circumstances using the Delphi method. *Chinese Nursing Research* **4**: 146-150.

Hastings-Tolsma M, Tasaka Y, Burton A, Goodman S, Emeis CL, Patterson E, Bennet P, Koschoreck K, Ruyak S, Tanner T, Vaughn T, Williams A. (2009) A profile of Colorado nurse-midwives. Implications for health care. *Western Journal of Nursing Research* **31(1)**: 24-43.

Hawkes, N., 2009. Handing over the prescription pad. *BMJ* **339**. doi: https://doi.org/10.1136/bmj.b4835

Hunter M, Eddy A. (2011) Changes to the medicines act regulations: Implications for midwives prescribing. *Midwifery News* **25**.

Ma Z, Chen G. (2018) Bayesian methods for dealing with missing data problems. *Journal of the Korean Statistical Society* **47**: 297-313.

McIntosh T, Stewart D, Forbes-McKay K, McCaig D, Cunningham S. (2016) Influences on prescribing decision-making among non-medical prescribers in the United Kingdom: systematic review. *Fam Pract* **33**: 572–9.

Merkx A, Ausems M, Budé, de Vries R, Nieuwenhuijze M. (2015) Dutch midwives' behavior and determinants in promoting healthy gestational weight gain, Phase 1: A qualitative approach. *International Journal of Childbirth* **5(3)**:126-38.

Naughton C, Drennan J, Hyde A, Allen D, O'Boyle K, Felle P, Butler M. (2013) An evaluation of the appropriateness and safety of nurse and midwife prescribing in Ireland. *Journal of Advanced Nursing* **69(7)**:1478-88.

Pearson A, Wiechula R, Court A, Lockwood C. (2005) The JBI model of evidence-based healthcare. *International Journal of Evidence Based Healthcare* **3**: 207-15.

Pearson A, Weeks S, Stern C. (2011) *Translation Science and the JBI Model of Evidence Based Healthcare*. Lippincott, Williams and Wilkins: Philadelphia, PA.

Perdok H, Jans S, Verhoeven C, Henneman L, Wiegers T, Mol BW, Schellevis F, de Jonge A. (2016) Opinions of maternity care professionals and other stakeholders about integration of maternity care: a qualitative study in the Netherlands. *BMC Pregnancy & Childbirth* **16(1)**: 188.

Sandelowski M, Voils C, Barroso J. (2006) Defining and designing mixed research synthesis studies. *Research in the Schools* **13(1)**.

Schellart AJM, Steenbeek R, Mulders HPG, Anema JR, Kroneman H, Besseling JJM. (2011) Can self-reported disability assessment behaviour of insurance physicians be explained? Applying the ASE model. *BMC Public Health* **19(11)**: 576.

Schoot van de R, Broere J, Perryck K, Zondervan-Zwijnenburg I, van Loey N. (2015) Analyzing small data sets using Bayesian estimation: the case of posttraumatic stress symptoms following mechanical ventilation in burn survivors. *European Journal of Psychotraumatology* **6**: 25216.

Silva P. (2006) *Exploring the Psychology of Interest*. Oxford University Press: New York.

Sinclair M. (2006) Editorial: Doctoral midwifery: an investment for the profession. *Evidence Based Midwifery* **4(1)**: 3.

Small K, Sidebotham M, Gamble J, Fenwick J. (2016) Exploring midwifery prescribing in Australia. *Women and Birth* **29**: 436-42.

Sterne J, White I, Carlin J, et al. (2009) Multiple imputation for missing data in epidemiological and clinical research: potential and pitfalls. *BMJ* **338**: b2393.

Stewart D, MacLure K, George J. (2012) Educating non-medical prescribers. *Brit J Clin Pharmacol* **74**: 662-7.

Stuijt CC, Franssen EJ, Egberts AC, Hudson SA. (2009) Reliability of the medication appropriateness index in Dutch residential home. *Pharmacy World Science* **31**: 380-6.

Sulosaari V, Kajander S, Hupli M, Huuppoonen R, Leino-Kilpi H. (2012) Nurse students' medication competence — an integrative review of the associated factors. *Nurse Education Today* **32**: 399-405.

Voils C, Hasselblad V, Crandell J, Chang Y, Lee E, Sandelowski M. (2009) A Bayesian method for the synthesis of evidence from qualitative and quantitative reports: the example of antiretroviral medication adherence. *Journal of Health Services Research & Policy* **14(4)**: 226-33.

Vries de H. (1993) Determinanten van gedrag [Determinants of behaviour]. In Damoiseaux V, Molen Hv, Kok G. *Gezondheidsvoorlichting en gedragsverandering* [Health information and behaviour changes]. Gorcum & Comp B.V.: Assen.

Vries de H, Mudde AN, Dijkstra A. (2000) The attitude-social influence-efficacy model applied to the prediction of motivational transitions in the process of smoking cessation. In Norman P, Abraham C, Conner M(Eds.) *Understanding and changing health behaviour: From health beliefs to self-regulation*. Harwood Academic: Amsterdam.