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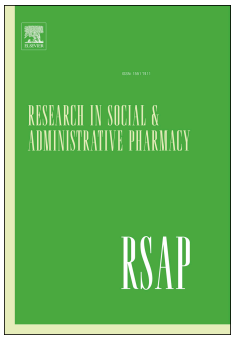

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A systematic review of community pharmacies' staff diagnostic assessment and performance in patient consultations

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A systematic review of community pharmacies' staff diagnostic assessment and performance in patient consultations

Background: Increases in patients seeking advice at pharmacies has led to pharmacy staff engaging in diagnostic behaviours. Approaches to diagnosis include using mnemonics and clinical reasoning.

Objectives: The primary aim of this review was to assess the degree to which the criteria researchers use to evaluate diagnostic performance in pharmacy consultations, in studies that have simulated patients or vignettes, conform with a clinical reasoning and a mnemonic framework. A secondary aim of the review was to characterize staff performance in the studies, based on the authors' comments of their results.

Methods: MEDLINE, EMBASE and Web of Science were searched between October 2016 and April 2017. Only peer-reviewed studies assessing pharmacy staff's diagnostic performance using simulated patients or vignettes were eligible for inclusion. Data were extracted about how each study's criteria conformed with clinical reasoning and mnemonic frameworks. A scoring system between 0 and 4 was devised to determine the degree to which studies aligned to these two approaches. Risk of bias was assessed using the NHI Study Quality Assessment Tools. The review was registered in PROSPERO with identification number CRD42017054827.

Results: Sixty-eight studies (55 cross-sectional, 11 educational interventions and 2 RCTs) with sample sizes between 10 and 2700 were included in the review. Most studies were of poor or fair quality. Performance of pharmacy staff was overwhelmingly reported as poor by study authors. This was the case regardless of geography, scenario used, or assessment framework adopted. Scrutiny on how authors arrived at these conclusions revealed that mnemonic criteria were employed to assess pharmacy staff's diagnostic performance rather than a clinical reasoning approach.

Conclusions: Potentially important aspects of the decision-making process, such as clinical reasoning, were left unexplored. The number and geographic distribution of the included studies is a strength of this review; however, a validated tool was not employed.

INTRODUCTION

In recent decades, self-care has been heavily promoted worldwide due to rising health-care costs.[1,2] This move toward patient empowerment has been supported by an increase in medicines being available to the public without the need for a prescription.[3] Community pharmacy staff are ideally placed to facilitate patient self-care and self-medication,[4-6] and indeed, community pharmacies have seen a rise in patients who visit in order to ask for help on minor ailments and advice on appropriate medication use.[7] However, community pharmacists tend to find accommodating this task particularly challenging[7] due to time constraints, and therefore, most consultations are often first conducted by counter staff who do not possess the knowledge and experience of pharmacists.[8,9]

To support pharmacy staff in this role, various protocols and guidelines, often using mnemonics, have been widely advocated and adopted, as they are easy to remember and quick to implement.[10] This, in theory, allows standardized questions to be asked in every consultation and will help gather all the necessary information for a diagnosis and an appropriate action to be taken. However, data suggests that these standardized methods do not necessarily improve consultation performance,[11-13] possibly because staff may ask questions with no direct relation to the examined conditions and the gathered information is then not useful for the decision-making process.

In medicine and nursing clinical reasoning processes are extensively used.[14] Clinical reasoning is an evidence-based, dynamic process in which the health professional combines scientific knowledge, clinical experience and critical thinking, with existing and newly gathered information about the patient. By the end of the process, all available information and logical inferences lead to the formation of a diagnosis.[15-17] This method has the disadvantage of being difficult to describe and hard to learn. However, it is advantageous as it improves clinical ability and is an effective method in establishing a diagnosis, possibly because all consultation information, either gathered through questioning or examining the patient, plays a part in the decision-making. In a community pharmacy context, reaching decisions is equally pertinent but is not as well-described in the literature.

A previous review[18] examined the rate and type of information gathered during community pharmacy consultations (only in developing economies) based on “common themes of the types of information that should be included in the information gathering

process according to the literature." Besides examining the rate and type of gathered information, however, it is also important to examine their relevance and purpose and how they contribute to the decision-making process. It is not known if and to what degree these aspects of a consultation, which are related to clinical-reasoning, are performed in pharmacy settings.

The primary aim of this review was to assess the degree to which the criteria authors use to evaluate diagnostic performance in pharmacy consultations, in studies with simulated patients or vignettes, conform with a clinical reasoning and a mnemonic framework. A secondary aim of the review was to characterize staff performance in the studies, based on the authors' comments of their results.

METHODS

A protocol for the review was submitted to PROSPERO with identification number CRD42017054827 and can be accessed at: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42017054827.

Study Selection

The inclusion criteria were that the study assessed pharmacy staff diagnostic performance and the assessment was described in some form; the pharmacist/pharmacy staff should have been presented with and required to have responded to a diagnostic scenario; and the scenario was presented in the form of simulated patients (SPs) or vignettes. Any study design was considered, including cross-sectional studies, interventions and randomized controlled trials. Studies needed to be peer-reviewed and published in English; no limit was set on publication date.

Studies were excluded when they did not provide an assessment of performance or a description of the assessment; when the pharmacist/staff had to deal with an already diagnosed condition; if they only looked at pharmacists'/staff's opinions on performance; or if they asked pharmacists/staff to follow specific screening methods or pre-set guidance that would prevent the potential use of any critical thinking.

The rationale behind the eligibility criteria was to include any study that had pharmacists and pharmacy staff presented with a new diagnostic scenario and in a setting as close to a real-life consultation as possible. A more exhaustive list of inclusion/exclusion criteria was included in the PROSPERO protocol; however, only the criteria that were encountered during the selection process are mentioned above.

Literature Search

Databases used to identify eligible studies were MEDLINE, EMBASE and Web of Science. Two of the authors (VS and PR) performed an initial scoping of the literature using the search algorithm ("community pharmac*") AND ("simulated patients" OR "mystery shopp*" OR "secret shopp*" OR "pseudo*" OR vignette*). Originally, it was planned to adapt the algorithm further; however, more detailed iterations of the algorithm did not improve the search results, and thus, it remained unchanged. Use of other bibliographic databases, as mentioned in the PROSPERO protocol, only provided duplicate results to the three databases previously mentioned and thus were not utilized.

Two rounds of searches were conducted. The first one took place on 03-11-2016 and the last one on10-4-2017, immediately before the extraction process. During the second round of searches, the reference lists of related literature were searched for additional titles. VS and PR independently screened the retrieved results titles and abstracts, with the third reviewer (MG) acting as arbitrator whenever conflicts arose. The same process was followed for full text screening. The website platform Covidence was used to facilitate this process.

Data Extraction and Analysis

Risk of bias analysis was conducted at the study level for each included study using the National Blood, Heart and Lung Institute's (NHLBI) of the U.S. Department of Health and Human Services Study Assessment Quality Tools, which rate studies as "good," "fair," or "poor." The Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies was used for the included cross-sectional studies, and the Quality Assessment of Controlled Intervention Studies tool was used for the included educational interventions and randomised controlled trials (RCTs). The analysis was conducted by VS, PR reviewed it, and disagreements were resolved through discussion.

Data were manually extracted and entered in Microsoft Excel by VS and checked for accuracy by PR. The extracted data were; *study characteristics*: publication year, country, type of study, participant characteristics, type of results (quantitative or qualitative); *quality characteristics*: reporting of study piloting, SP training, data collection method; *methodology characteristics:* type of methodology (SPs or vignettes), number of SPs, number of scenarios, type of scenarios (symptom presentation or product request), SP role (presenting for themselves or someone else); *assessment characteristics*: how assessment criteria were

derived, whether studies assessed diagnostic performance in general or focused on the diagnosis of a specific condition, which medical conditions were used for the scenarios, whether staff knowledge was assessed, and whether studies compared community pharmacists' performance with other pharmacy staff performance. A sub-analysis was conducted to establish whether there were differences in the types of conditions that studies of developed and developing economies focused on, as this might have been a reason for subsequent differences in results between countries of different economic profiles.

Descriptive statistics (total numbers and percentages) were used to report the results.

Data were also extracted about how each study's criteria conformed with clinical reasoning and mnemonic frameworks. To achieve this, both were broken down into 4 characteristics (as noted below), and study texts were qualitatively analysed and coded for passages that corresponded to each characteristic. A value of one was assigned for each characteristic exhibited, meaning each study could score between 0 and 4. Mode and modal values were used to report the results.

These characteristics were developed by VS, after an initial familiarization with the included studies, as summaries of key aspects of clinical reasoning and mnemonic questioning that the authors could have reflected on in their studies. The characteristics were reviewed by PR, and, after discussion, adjustments were made until an agreement was reached. All included studies were then searched by VS for passages that indicated whether the authors have considered each respective characteristic in the methodology they used when reporting their results or when discussing their results. If that occurred, the study would be awarded one point per characteristic; if not it would be awarded no points. The scoring was reviewed by PR, and disagreements were resolved through discussion.

Clinical Reasoning and Mnemonic Framework Characteristics

Clinical reasoning framework:

1. The authors assessed staff on questions with specific relevance to the scenario condition (this indicates a basic level of clinical reasoning, even if they do not explicitly mention how or why the questions are relevant), e.g. for an emergency contraception scenario staff were expected to ask the question "when was your last menstrual cycle?".

2. The authors have mentioned the purpose of the questions they assessed staff against (this indicates that authors have considered why the questions are asked), e.g. for a sleeplessness scenario, patients were asked about their medication because it might be causing or contributing to the patient's sleeplessness.
3. The authors have reflected on how staff use the gathered information during the decision-making process (this indicates that authors have considered the importance of information interpretation in some manner), e.g. in a dyspepsia scenario, a response to the question about pain location led the pharmacist to consider indigestion as a possibility.
4. The authors considered whether there is a connection between the information gathered and the final decision taken by staff (this indicates that information gathering should be used for decision-making, even if the decision-making process is not described).

Mnemonic framework:

1. The authors have assessed staff against questions (regardless of whether they are relevant to the condition or not), e.g. in a common cold scenario staff were expected to ask the patient's age.
2. The authors have assessed staff against a checklist of questions they were expected to ask, e.g. • Check symptoms • Check length of symptoms • Check other medication • Check other health condition • Refer if needed • Provide information.
3. The authors have explicitly mentioned they used a known mnemonic method, guidelines or recommendations to assess performance, e.g. WWHAM, WHO guidelines, Australian practice recommendations.
4. The authors have reported the final decision staff made (irrespective of whether it was connected to the information gathering or not), e.g. "In 90% of the scenarios not appropriate for self-medication, a recommendation was made for the customer to see a physician/GP, but in only 30% of those referrals was there sufficient urgency."

Each study was also coded for passages that indicated whether the authors' outlook on the diagnostic performance of the staff assessed in their studies was positive, negative or mixed. The results and discussion sections of each study were searched and coded accordingly by VS for language that indicated whether authors viewed the diagnostic performance of the staff in their studies in a positive or negative way or whether they had a

mixed reaction. The coding was reviewed by PR, and revisions were made until consensus was reached.

RESULTS

The database search yielded 732 results, 353 of which were excluded as duplicates. The titles and abstracts of the remaining 379 were screened, and 264 of them were excluded. Full text screening was performed for 115 studies. From those, 47 studies were excluded based on the inclusion/exclusion criteria leaving 68 studies to be included in the review (Figure 1).

Study Characteristics

The included studies were published between 1989 and 2017, with the number of studies increasing steadily with each passing decade. The majority of the studies took place in Europe, most prominently the UK, Australasia and Eastern Asia. Forty-one of the studies originated from developed countries and 27 from developing economic regions (based on UN country classification available at www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/2015wesp_full_en.pdf) (Table 1).

Most studies (n=55) employed a cross-sectional study design; however eleven[25,29-31,34,35,38-40,46,70] studies were educational interventions with a before and after design and two[37,75] were RCTs. Sample size varied widely between studies (10-2700 staff tested); only thirteen[27,46,53,56,59,60,64,67,68,71,72,86,87] studies reported on how the sample size was calculated (Appendix).

In most of the studies (n=43), any member of the pharmacy team was the subject of investigation. In some cases,[21,25,26,33,41,42,50,52,57,72,78] it was not possible to verify staff role, either because the researchers stated they were not able to do so, or because the study did not make it clear. The terminology used to describe 'other' pharmacy staff was divergent, often location-specific, and not always clear to gauge what role they had or the level of training/qualification they held. All studies except one[55] (purely qualitative) used quantitative methods to report their results, although four[36,48,79,87] studies did use a combination of quantitative and qualitative methods (Table 2).

Quality Characteristics

Risk of bias assessment analysis for the cross-sectional studies rated ten[21,26,33,41,42,50,52,57,72,78] to be of poor quality and the other 45 to be of fair quality. As these studies had many things

in common, in terms of research questions, methodology and outcome measures, the main differentiating factor between fair and poor quality was whether they accurately defined their study population. For the differentiation between fair and good, no studies met the criteria for good, as none assessed their population more than once, all studies' outcome measures were not reliable enough, and only one study[86] mentioned that their SPs were blinded to the correct scenario responses.

Assessment for the educational interventions and RCTs found nine studies[25,29,30,31,34,35,37, 70,75] to be of poor quality and four[38,39,40,46] to be of fair quality, with the main reasons for lowering quality being non-adequate randomization, not describing adherence to training protocols, and not reporting the statistical power of their main outcomes. Further, due to their nature, sufficient blinding and training allocation were not possible.

Study piloting was reported to have happened in only 29% (n=20) of studies. Only one[34] of the educational interventions reported piloting. Despite low levels of reported piloting, most (71%, n=44 out of 62) SP studies, did report on the training provided to SPs prior to data collection. In the vast majority of the studies (84%, n=57), data collection forms were completed after pharmacy staff interaction. In 18 studies (26%), the use of audio or video recording was employed. Twelve (18%) used both of these methods to be able to verify the content of the collection forms (Appendix).

Methodology Characteristics

The most prominent methodology used to assess pharmacist and staff performance was through simulated patients; only 5 studies used vignettes,[44,47,48,55,62] whilst one[80] study used both. The number of SPs used in the studies ranged from one to more than 10; however, most studies employed one or two SPs (n=24). Similarly, the numbers of scenarios used in the studies ranged from one to 64; however, most used one or two scenarios (n=48). A mixture of symptom presentation and product request scenarios (n=38) were most commonly employed, although 20 studies solely used symptom presentation scenarios and 6 studies were product request scenarios only. In most of the scenarios (n=39), the SPs presented as themselves, and in 19 studies the SP requested advice or product for a third person such as a child, relative or a friend. Nine studies used both types of presentation (Appendix).

Assessment Characteristics

Many of the studies (n=29) used published guidelines, recommendations and standards, and a further 10 based their assessment on criteria used in other published studies. Eighteen studies stated that the authors had derived their own criteria, whilst 10 studies used 'expert panels'. Eight studies explicitly mentioned basing their criteria on mnemonic acronyms, most commonly mentioned of which was WWHAM (W*ho is the patient,* W*hat are the symptoms,* H*ow long have the symptoms been present,* A*ction taken,* M*edication being taken*). Sixteen studies used some form of scoring system for their results (Table 2).

Most studies (n=46) evaluated staff's performance on specific health conditions whilst the remainder (n=22) assessed general diagnostic performance. Sub-analysis of data comparing condition with country showed that studies conducted in developed economies tended to concentrate on women's health, such as emergency contraception, and central nervous system conditions, such as insomnia and headache. Those studies emanating from developing economies concentrated on conditions such as diarrhea and sexually transmitted diseases (Appendix).

Assessment Framework Ratings

Based on our scoring system, studies tended to have, in total, higher mnemonic characteristics in their assessment methods of pharmacy staff's performance, with a modal value of 3, and lower clinical reasoning characteristics, with a modal value of 0. Inter-rater agreement for the clinical reasoning rating was 80.5% and 82.4% for the mnemonic rating, before disagreements were resolved through discussion. There were no great differences in modal values between developed and developing economies ratings (clinical reasoning modal value of 0 for both, 2 for developing countries' mnemonic rating and 3 for developed countries' mnemonic rating), or between studies that set out to assess general diagnostic performance or a specific condition (clinical reasoning modal value of 0 in both cases, mnemonic rating modal value of 3 for general performance and 4 for specific conditions). For each mnemonic framework characteristic individually, 69% of studies assessed performance based on questions not always relevant to scenario condition, 85% used checklists, 43% used named mnemonics or guidelines, and 74%have reported the final decision staff made. For each clinical reasoning framework individually, 53% of studies assessed performance based on questions with relevance to the condition at hand, 12% reported purposes for the questions asked, 7% reflected on how the gathered information

was used, and 24% considered a connection between the information gathering process and the decision-making outcome.

Study Authors' Outlook on Performance

Nine of the 68 studies' authors described pharmacy staff's performance in positive terms (example quote: "*Results across all scenarios indicated the provision of a training program […] led to a significant improvement in performance*[30]"), whilst 8 described them in mixed terms; the vast majority of authors (n=51) used negative terms (example quote: *"assessment and counselling provided to such patients were inadequate"*[63]) to describe their results of pharmacy staff's performance. Three of the thirteen educational interventions and RCT studies used positive language compared to 6 of the 55 cross-sectional studies. Three of the four educational interventions that were assessed to be of fair quality used negative language for their results (Table 5).

Comparisons

Eleven studies included a theoretical assessment of staff's knowledge (in the form of a questionnaire) which was then compared to actual performance through SPs or vignette methodology. Seven[21-23,35,45,71,86] reported actual performance was worse than the performance measured with the questionnaires; one[41] study found them to be similar and the other two[25,39] did not report that information. In the 13 studies that reported comparisons between community pharmacists and other staff, nine[20,37,43,59,66,67,73,76,83] reported pharmacists performing better and four[21,60,85,86] reported similar performances.

Discussion

Performance of pharmacy staff was overwhelmingly reported as poor by study authors, a result which has been reflected in other reviews.[88] This appeared to be the case regardless of geography, scenario used or whichever assessment framework was utilized. Scrutiny on how authors arrived at these conclusions revealed that they relied on mnemonic criteria to assess pharmacy staff's diagnostic performance rather than a clinical reasoning approach. This means that potentially important aspects of the decision-making process, which clinical reasoning incorporates, were left unexplored.

The mnemonic framework provided simple quantifiable results, such as numbers of questions asked and the ability then to produce a score; however, mnemonic characteristics have been called into question in establishing pharmacy staff ability to derive a

diagnosis.[12,13,48] The various existing guidelines and well used mnemonics, such as WWHAM (commonly taught in UK pharmacy schools), appear to be viewed as appropriate instruments by authors. However, to aid a better representation of the actual level of diagnostic staff performance, new tools need to be developed that are more aligned with a clinical reasoning approach, which would allow for the assessment of all parts of the decision-making process. New tools should expand further than measuring the amount of questions being asked based on standardized mnemonic methods and examine whether questions being asked by pharmacists and staff are derived from evidence-based knowledge of the scenarios presented to them, what pharmacists or staff want to achieve through their questions and observations, and how everything relates to their decision-making process and their final decisions. Because these concepts are very difficult to be described and examined in quantitative terms, more qualitative methods could be employed by researchers, as they could be used in researching community pharmacists' and other staff's thought process during consultations, identify pharmacists', staff's and pharmacy students' needs and attitudes towards improving their diagnostic skills, examine the impact of educational interventions on decision-making and diagnostic abilities, and other potential research topics. Qualitative methodology has been underutilised so far, with only four included studies in this review using this approach.

Tools that would be validated, and subsequently more reliable, would help improve the overall quality of future studies and avoid risk of bias. Future studies should also take care in defining their study populations and having their participants and assessors be blinded to the correct scenario responses. Educational interventions aimed at improving diagnosing ability could employ adequate randomisation, include in their results to what extent protocols are adhered to, report the statistical power of their results, and have a longer length and more follow-ups to make sure any positive results can last over time.

Comparisons of pharmacy staff versus pharmacists showed that, overall, pharmacists performed better. This is to be expected, as pharmacists have more extensive training than other pharmacy staff. Pharmacists should be more visible and proactive in undertaking patient consultations rather than leaving this role to less well-trained staff.[9] In studies where actual performance was compared to theoretical performance, staff performed more poorly in the real-life situation scenarios. This dissonance suggests that decision making skills of staff are poorer than they perceive, whereby they possess knowledge but do not

know how to use it critically. This performance gap is somewhat substantiated through the findings of the educational intervention studies, which showed broadly positive results (Table 5), although these studies were mostly short-term and of not good quality. Thus, we cannot draw any firm conclusion about how long these effects may last. However, these comparisons were based on very limited numbers of studies and larger reviews would be needed to substantiate these findings.

Limitations

Limitations of this review were that it only captured studies published in English and did not include any relevant grey literature. However, it included studies from all over the world, and its scope was not narrowed to the specific sets of practices and attitudes of any given location. The characteristics developed to code for the clinical reasoning and mnemonic frameworks and the coding of the authors' outlook on their results do not represent a validated tool. Instead, they are the review authors' attempt at establishing a method that would allow to study the extent to which these two diagnostic frameworks are used and how results are interpreted in the current literature, something that has not thus far been attempted in community pharmacy, to the best of our knowledge. By including only studies that used simulated patients and vignettes, the benefit is that the included studies approximated real-life consultations. The studies included in this review did not allow for meta-analysis, but inclusion of diverse studies did allow for a greater variety of data sources to be included.

CONCLUSIONS

The current literature assessing pharmacists' and pharmacy staff's diagnostic ability via simulated patients or vignettes overwhelmingly relies on a mnemonic rather than a clinical reasoning framework. Based on authors' comments about their results, the common perception is that pharmacists' and staff's diagnostic ability is poor, regardless of geography, diagnostic scenarios or assessment framework. A limited amount of studies found pharmacists perform better than other pharmacy staff. The quality of future studies can be improved, and new tools should be developed for future assessments that go further than measuring the amount of questions asked and deeper examine the decision-making process during consultations.

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Table 1 Publication year and country

Criterion	Studies	References
Year		
1989	1	20
1990-1999	6	21,22,23,24,25,26
2000-2009	21	27,28,29,30,31,32,33,34,35,36,37,38,39, 40,41,42,43,44,45,46,47
2010-2017	40	48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64, 65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81 82,83,84,85,86,87
Country		
UK	14	13-15,20,22,28,35,36,43,48,51,52,84
Europe	9	27,31,34, 42, 46, 50, 58, 78, 79
Eastern Asia	*13*	26, 41, 49, 54, 59-61,67,68,72, 80, 83, 86
Western Asia	*3*	21,73, 63
Northern America	*4*	24,47,55, 70
Southern America	*4*	44,56,69,74
Australasia	*15*	29,30,33, 57,62,64,65,66,75-77,81,82,85,87
Africa	*5*	32, 40, 45, 53, 71
Transnational	1	25
developing countries	27	21,25,26,32,40, 41,44,45,47,49,53,54,56,59-61,63,67,68,69,71,72-74,80,83,86
developed countries	41	20,22-24,27-31,33-39,42,43,46,48,50-52,55,60,62,64-66,70,75-79,81,82,84,85,87

Table 2 Other study characteristics

Sample Characteristics	**Studies**	**References**
CPs only	18	22-24, 28,36,44,48,54-56, 58, 62-64, 69-71, 74
Any pharmacy staff	44	20,21,26,27,29-31,33-35,37,38,40-43,46,47,50-52,57,59-61,65-68, 72,73, 75-87
Non-CP staff only	5	25,32,39,45,53
CPs and GPs	1	49
Type of results		
Quantitatively (descriptive or more advanced statistics)	67	all studies except 55
Quantitatively (using a scoring system)	16	24,27,30,34,38,46,58-60,64,68,69,79,81-83
Qualitatively (themes)	1	55
Both quantitatively and qualitatively	4	36,48,79,87

(CP=Community Pharmacist, GP=General Practitioner)

Table 3 Assessment criteria basis

Assessment criteria were decided based on:		
author derived	18	22,23,31,34,35,43-48,57,72,75,79,82,85
paper	10	49,50,52,62,64-66,69,70,74
standards/guidelines/recommendations	29	25,28-30,32,34,37,39,44,47,51,54,57-61,64,68, 71,75-78,83,84,86,87
WWHAM protocol	6	37,38,39,42,54,84
WHAT-STOP-GO protocol	1	81
other protocols	1	54
expert panel	10	24,33,36,38,56,62,64,69,84,86
n/a	9	20,21,27,41,45,53,63,73,80

Table 4 Mode score values per characteristic and median values for total scores

Characteristic	***CR1***	***CR2***	***CR3***	***CR4***	***MN1***	***MN2***	***MN3***	***MN4***	***Total CR***	***Total MN***
Mode	*1*	*0*	*0*	*0*	*1*	*1*	*0*	*1*		
Median									*1*	*3*

(CR=clinical reasoning, MN=mnemonic)

Table 5 Authors outlook on staff's performance results

Authors' outlook on diagnostic performance	*n*	*Reference (*denotes educational intervention)*
Positive	9	28, 29*, 30*, 37*, 46*, 53, 55,65, 66
Mixed	8	27, 31*, 58, 62, 70*, 79, 80, 84
Negative	51	20-24, 25*, 32, 33, 34*, 35*, 36, 38*, 39*, 40*, 41-45, 47-52, 54, 56, 57, 59-61, 63, 64, 67-69, 71-74, 75*, 76-78, 81-83, 85-87

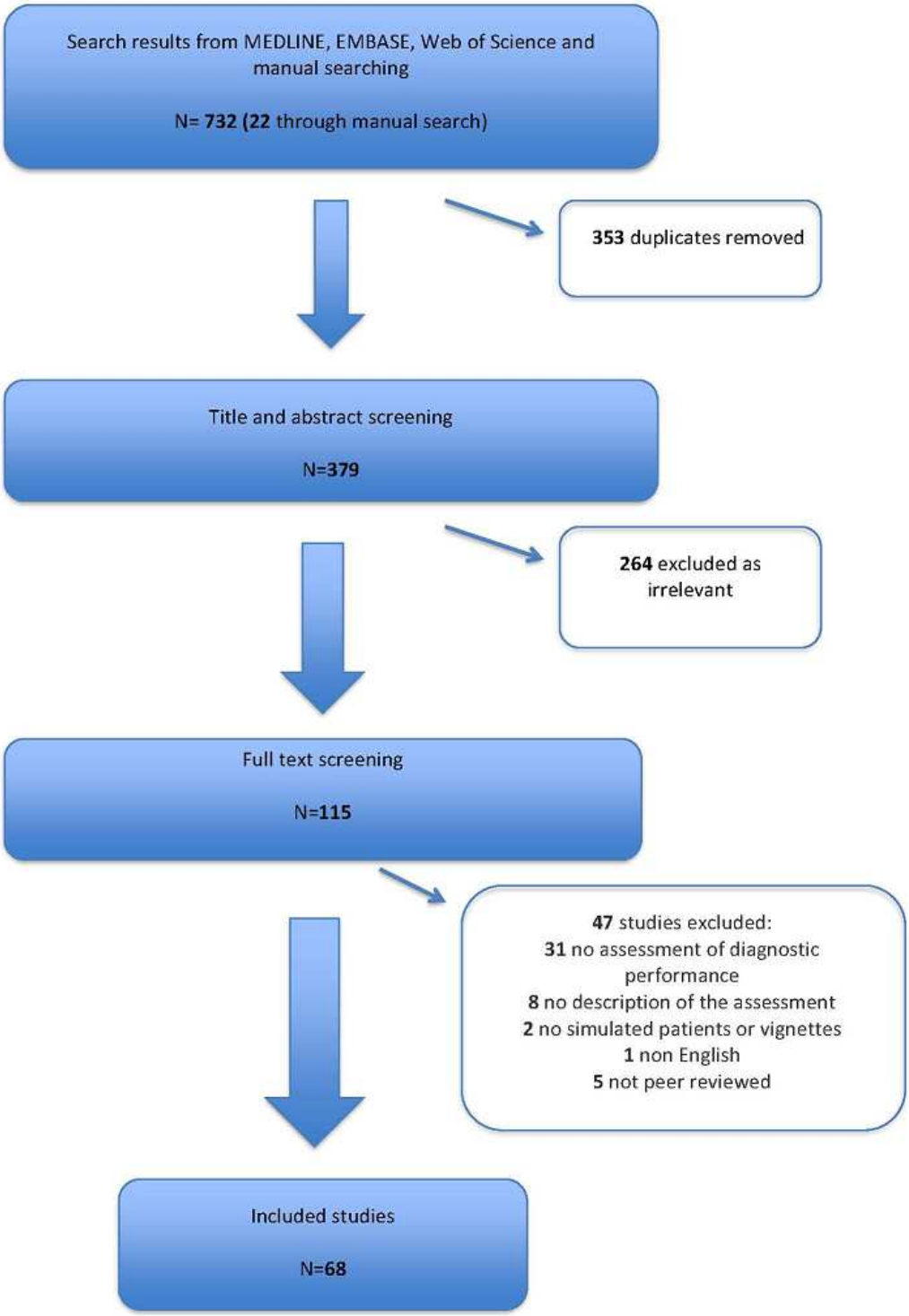

Figure 1: Inclusion and Exclusion Flow Chart

Appendix

Table 6 Types of studies and sample sizes

Type of study	Studies	References	Sample size	Studies	References
Cross-sectional	55	20-24, 26-28, 32,33,36, 41-45, 47-49, 50-69, 71-74, 76-87	<100:	28	20,22,23,28,32,36,43-45,48,51,52,54-58,61,64,69,73,74,77,79,81,84,85,87
			101-200:	12	24,26,42,47,49,62,65,71,76,80,82,86
			201-300:	8	21,27,41,66-68,72,78
			>301:	7	33,50,53,59,60,63,83
Educational interventions	11	25, 29-31, 34,35, 38-40, 46, 70	<100:	5	31,38,39,40,70
			101-200:	2	35,46
			201-300:	1	34
			>301:	3	25, 29,30
Randomised Controlled Trials (RCTs)	2	37, 75	<100:	1	75
			>301:	1	37

Table 7 Quality characteristics

Criterion	Studies	References
Was there a pilot to the study reported by the authors?		
yes	21	22,26,33,34,36,42,44,48-50,54,56,58,62,63,71,76,77,80,82,87
no	47	20,21,23-25,27-32,35,37-41,43,45-47,51-53,55,57,59-61, 64-70, 72-75, 78,79,81,83-86
Did SPs* receive training for the study?		
yes	54	
training mentioned	44	24,25,27-30, 33-41, 45,46,49,52,53,56-60, 65,69, 70,72-87
the SPs had previous experience	5	20,42,66,67,68
One or more of the authors were SPs	6	26,22,31,43,54,61
external paid service was used	1	50
not mentioned	6	21,23,26,32,51,63
How was data captured?		
audio/video recorded and transcribed	18	28,30,33,34,38,39,42,46,48,55,56,58,65,66,69,74,79,84
data collection form	57	20-27, 30-45,47,51,54, 57-64, 67-87
paid service	1	50

n/a	3	29,52,53

(SP=Simulated Patient)

Table 8 Methodology characteristics

Methodology	**Studies**	**References**
SP*s	62	20-43, 45,46, 49-54, 56-61, 63-79, 81-87
vignettes	5	44, 47, 48, 55, 62
both	1	80
Number of SPs		
1	13	20,22,23,26,31,36,43,45,54,64,70,87
2	11	24,28,32,42,51,56,57,69,73,75
3	4	21,58,77,78
4	4	52,76,82,86
5	1	41
6	4	27,65,72,81
7	2	70,72
8	1	71
9	1	37
10	4	40,67,80,84
>10	4	33,49,50,63
n/a	12	25,29,30,46,53,60,61,66,68,79,83
Number of Scenarios		
1	32	20-23,25,27,35,41-45,48,49,51,52,59,60,64-68,70,71,74, 76,77,80,83,86,87
2	16	26,28,31,32,33,36,46,55,56,57,63,69,73,75,82,85
3	7	30,38,47,50,53,58,72
4	5	24,34,39,78,84
≥5	4	37,62,79,81
n/a	4	21,29,61,40
Type of scenario		
Symptom presentation	20	20,21,23,25,26,28,35,36,40,42,43,45,47-49,51,52,65,71,73
Product request	6	46,64,75,77,82,87
both	38	22,24,27,30-34,37-39,41,44,50,53-58,60,62,66-70,72,74,78-80,83-86
n/a	4	29,59,61,63
SP role		
for themselves	32	22,27,28,31-33,36-38,40,45,46,49,56,58-61,63,64,66-68, 70,74-77,80,82,85,87
for someone else (child, relative, friend)	19	20,21,23,25,35,41-43,51-54,65,71,78,81,83,84,86
both	9	24,26,34 50,57,69,72,73,79
n/a	3	29,30,39

(SP=simulated patient)

Table 9 Conditions for general performance assessment or specific condition

Criterion	**Studies**	**References** *(*denotes developing country)*
Studies assessing diagnostic ability of a specific condition		
women's health		
Contraceptive management	4	28,57,77,78
Diseases of the genitourinary system		
dysmenorrhoea	1	22
Diseases of the visual system		
dry eye	1	51
allergic conjuctivitis	1	52
Diseases of the muscoskeletal system		
back pain	1	54*
Diseases of the nervous system		
headache	2	58,74*
insomnia	4	59*,64,70,85
serotonin syndrome	1	65
Diseases of the respiratory system		
Acute respiratory infection	1	60*
chronic cough	1	76
common cold	1	81
Diseases of the digestive system		
peptic ulcer	1	61*
lower bowel symptoms	1	62
GORD	1	66
dyspepsia	1	68*
diarrhoea	9	21*,23, 25*,42, 44*,71*,73*,83*,86*
Conditions related to sexual health		
gonnorhoea and genital ulcer disease	1	32*
urethral discharge	4	40*, 41*, 45*, 47*
Diseases of the circulatory system		
acute cardiac symptoms	1	63*
Neoplasms		
oral cancer	3	20,43,59
Certain infectious or parasitic diseases		
malaria	1	67*
tuberculosis	1	80*

Product requests		
codeine analgesics	1	82
Antibiotics	1	26*
Criterion	**Studies**	**References**
Studies assessing general diagnostic performance using scenarios of		
Contraceptive management	1	79
Certain infectious or parasitic diseases		
vaginal thrush	2	33,34
Diseases of the visual system		
eye discomfort	1	84
Diseases of the muscoskeletal system		
back pain	1	84
leg cramps/fatigue	1	24
Diseases of the nervous system		
headache	4	27,31,36,69*
insomnia	1	55
facial pain	1	56*
Diseases of the respiratory system		
Acute respiratory infection	1	53*
allergic rhinitis	1	24
common cold	6	49*,50, 53*, 56*, 79,84,24
Diseases of the digestive system		
abdominal pain	1	36
indigestion	1	38
vomiting	1	84
dyspepsia	2	48,79
diarrhoea	4	24,69*,79,84,
Product requests	11	27,31,33,34,38,46,50,53*,72*,78,79
Study evaluated:		
General performance	22	24,27,29-31,33,34,36,38,39*,46,48,49*,50,53,55,56*,69*, 72*,78,79,84
Specific condition	46	20,21*-23, 25*, 26*, 28, 32*, 35, 37, 40*, 41*, 42, 43, 44*, 45*, 47*, 51,52, 54*, 57,58, 59*, 60*, 61*, 62, 63*, 64-66, 67*, 68*, 70, 71*, 73*, 74*, 80*, 83, 83*, 85, 86*, 87

Table 10 Clinical reasoning (CR) and mnemonic characteristics scoring for each study

study reference	CR1	CR2	CR3	CR4	CRTOTAL	MN1	MN2	MN3	MN4	MNTOTAL
20	0	0	0	0	0	0	0	0	1	1
21	1	0	0	0	1	0	1	0	1	2
22	1	1	0	0	2	1	1	0	1	3
23	1	0	0	0	1	1	1	0	1	3
24	1	0	0	1	2	0	1	0	0	1
25	1	0	0	0	1	0	1	0	1	2
26	1	0	0	1	2	0	1	0	0	1
27	0	0	0	0	0	1	1	0	1	3
28	1	0	0	0	1	1	1	1	1	4
29	0	0	0	0	0	1	1	1	0	3
30	0	0	0	0	0	1	1	1	0	3
31	0	0	0	0	0	1	1	0	1	3
32	1	0	0	1	2	0	1	1	0	2
33	1	1	0	1	3	0	1	0	0	1
34	0	0	0	0	0	1	1	1	0	3
35	1	0	0	0	1	1	1	0	1	3
36	1	1	1	1	4	0	0	1	0	1
37	1	0	0	0	1	1	1	1	1	4
38	0	0	0	0	0	1	1	1	1	4
39	0	0	0	0	0	1	1	1	1	4
40	1	0	0	1	2	0	1	0	0	1
41	1	0	0	0	1	1	1	0	1	3
42	1	0	0	0	1	1	1	1	1	4
43	0	0	0	0	0	0	0	0	1	1
44	1	0	0	0	1	0	1	1	1	3
45	1	0	0	0	1	0	1	0	1	2
46	0	0	0	0	0	1	1	0	1	3
47	0	0	0	0	0	0	0	0	1	1
48	1	1	1	1	4	0	0	0	0	0
49	1	0	0	1	2	1	1	0	0	2
50	0	0	0	0	0	1	1	0	1	3
51	1	0	0	1	2	1	1	1	0	3
52	1	0	0	1	2	1	1	0	0	2
53	0	0	0	0	0	1	1	0	1	3
54	0	0	0	0	0	1	1	1	1	4
55	1	1	1	1	4	0	0	0	0	0
56	1	0	1	1	3	1	1	0	0	2
57	1	0	0	0	1	1	0	1	1	3
58	0	0	0	0	0	1	1	0	1	3
59	0	0	0	0	0	1	1	1	1	4
60	0	0	0	0	0	1	1	1	1	4

61	1	0	0	0	1	1	1	1	1	4
62	1	1	1	1	4	0	0	0	0	0
63	0	0	0	0	0	1	1	1	1	4
64	1	0	0	0	1	1	1	0	1	3
65	1	1	0	1	3	0	1	0	0	1
66	0	0	0	0	0	1	1	0	1	3
67	0	0	0	0	0	1	1	1	1	4
68	0	0	0	0	0	1	1	1	1	4
69	0	0	0	0	0	1	0	0	1	2
70	1	1	0	0	2	1	1	0	1	3
71	1	0	0	1	2	0	1	1	0	2
72	0	0	0	0	0	1	1	0	1	3
73	1	0	0	0	1	1	1	0	1	3
74	0	0	0	0	0	1	1	0	1	3
75	0	0	0	0	0	1	1	0	1	3
76	0	0	0	0	0	1	1	1	1	4
77	1	0	0	0	1	1	1	1	1	4
78	0	0	0	0	0	1	1	1	1	4
79	0	0	0	0	0	1	1	0	1	3
80	0	0	0	0	0	0	0	0	1	1
81	0	0	0	0	0	1	1	1	1	4
82	0	0	0	0	0	1	1	1	1	4
83	0	0	0	0	0	1	1	1	1	4
84	1	0	0	0	1	1	1	1	1	4
85	1	0	0	0	1	1	1	1	1	4
86	1	0	0	1	2	0	1	0	1	2
87	1	0	0	0	1	0	1	0	1	2
MODE	**1**	**0**	**0**	**0**		**1**	**1**	**0**	**1**	
MEDIAN					**1**					**3**