Patient safety culture in maternity units: a review

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Abstract
Purpose: To summarize studies that have examined patient safety culture (PSC) in maternity units and describe the different purposes, study designs and tools reported in these studies, whilst highlighting gaps in the literature.
Methodology: Peer-reviewed studies published in English during 1961-2016 across eight electronic databases were subjected to a narrative literature review.
Findings: Among 100 articles considered, 28 met the inclusion criteria. The main purposes for studying PSC were: (a) assessing intervention effects on PSC (n= 17); and (b) assessing PSC level (n=7). Patient safety culture was mostly assessed quantitatively using validated questionnaires (n=23). The Safety Attitude Questionnaire was the most commonly used questionnaire (n=17). Intervention varied from a single action lasting five weeks to a more comprehensive package lasting more than four years. The time between the baseline and the follow-up assessment varied from six months up to 24 months. No study reported measurement or intervention costs, and none incorporated the patient's voice in assessing PSC.
Practical Implications: Assessing PSC in maternity units is feasible using validated questionnaires. Interventions to enhance PSC have not been rigorously evaluated. Future studies should report PSC measurement costs, adopt more rigorous evaluation designs, and find ways to incorporate the patient's voice**.**
Originality/Value: This review summarized studies examining PSC in a highly important area and highlighted main limitations that future studies should consider.

Keywords: Patient safety culture; Patient safety climate; Maternity; Obstetrics

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Introduction
The United Nations Sustainable Development Goal Number 3.1 aims to reduce global Maternal Mortality Ratio (MMR) to less than 70 per 100,000 live births by the year 2030

(United Nations, 2015). Despite a decline since 1990, MMR in 2015 was above 200 for every 100,000 live births - equivalent to 303,000 mothers dying owing to pregnancy or childbirth-related complications (World Health Organization, 2015). This mismatch between the target and MMR current level requires healthcare providers to invest in new strategies to improve maternity service quality and safety. Strategies have been applied and been found to improve quality and patient safety; e.g., checklists, reminders, hand hygiene, training and medication reconciliation (Shekelle *et al.*, 2013). However, these strategies will not produce expected improvements without an environment that encourages, reminds, and motivates staff towards improving patient safety. This environment has been called patient safety culture (PSC) or patient safety climate (PSC). Developing PSC is a pre-requisite for successful patient safety improvement initiatives (Weaver *et al.*, 2013).

What is known about PSC?

Several systematic reviews related to PSC were conducted, which reflect both its importance and the commitment level to improve patient safety. DiCuccio (2015) studied the relationship between PSC and patient outcomes. He found that improved PSC is significantly associated with reduced mortality; increased family and patient satisfaction; reduced readmission rates; decreased community acquired pneumonia rate; and decreased hospital acquired pressure ulcers. Groves (2014) noted a non-significant relation between PSC and patient outcomes explained by the dwindling studies included in their review.

Guldenmund (2000) reviewed the relationship between safety culture and safety climate and observed that safety culture is the basic assumption within an organisation, but these assumptions are not necessarily about safety. However, safety climate is the prevailing attitude within an organisation. Halligan and Zecevic (2011) found that researchers had different PSC concepts, definitions, dimensions and measures . They also found that the most common term was safety culture compared to safety climate, but few publications use both terms alternatively. The different tools for measuring PSC were reviewed by Colla *et al.*, (2005), who found that there are nine different tools for measuring PSC, all using Likert scales; while Singla *et al.*, (2006) found 13 instruments covering 23 dimensions. Morello *et al.*, (2013) reviewed different strategies used to improve PSC and concluded that among 11 different documented impact strategies, leadership walk-rounds and multifaceted unit-based programs have a positive impact on PSC. They suggested that healthcare providers should carefully evaluate the strategy effectiveness before implementing it.

PSC in Maternity Care Units (MCU)

Examining hospital level PSC provides an overall prevailing culture that may arguably reflect the culture within individual departments. Sinni *et al.*, (2011) reported that departmental level is the most appropriate for studying PSC. At this level, improvement strategies can be tailored to specific departments rather than a strategy that may only work in one department. They reviewed the initiatives related to patient safety in maternity but did not specifically discuss the work related to PSC in MCU. There is neither an agreed term nor a single definition for safety culture. Within this article, both safety culture and safety climate were included despite the definition that authors used. Conducting a departmental level review is important because studying PSC at the unit level helps in tailoring future improvement strategies (Smits *et al.*, 2009).

Methods

Our aim was to review studies that examined PSC in Maternity Care Units (MCU). Our specific objectives were to: (a) describe different reasons for examining PSC; (b) report different designs and tools that have been used to examine PSC; and (c) identify gaps in the literature. For Booth *et al.*, (2012), a narrative review is where the literature is reviewed

comprehensively and systematically allowing reviewers to descriptively summarise different study designs using summary tables. It identifies gaps and to a lesser extent commonalities (Lucas *et al.*, 2007). All 28 studies were quality assessed.

Table I here

Search strategy
Search terms were first used in Medline and applied to other databases. The search terms was informed by those used in other PSC-related systematic reviews (Groves, 2014; Halligan and Zecevic, 2011). Terms appearing as key words and subject headings were combined to search for articles that assessed MCU PSC. Terms used to search for maternity related articles include Matern*, Obstetric*, gyn*cology and reproductive health service*, which were combined with terms that covered patient safety culture, safety climate and safety attitude (**Error! Reference source not found.**).

Data sources
The search engines used for this literature review were: Cumulative Index to Nursing and Allied Health Literature (CINAHL); Embase (not Medline); the Health Management Information Consortium (HMIC); Medline; Psych INFO; Allied and Complementary Medicine Database (AMED); Applied Social Sciences Index and Abstracts (ASSIA); and Maternity and Infant Care Database (MIDIRS).

Inclusion criteria
In this review, peer reviewed publications measuring MCU patient safety culture/climate were included. Only studies written in English and freely accessible were reviewed. No limits were made for the publication year, study design or the setting under which the study was taken.

Exclusion criteria
Studies that only discussed PSC concepts and definitions, reviewed patient safety without referring to patient PSC, or examined the whole hospital without specifically mentioning MCU were all excluded. Publications that examined overall organizational culture and those that assessed patient safety program effects on patient safety outcomes without reference to PSC were also excluded.

Data extraction
Data extraction and data synthesis were performed simultaneously using tables to summarize key information and results (**Error! Reference source not found.** and **Error! Reference source not found.**)

Findings
A total of 5630 articles were retrieved across eight databases. After removing duplicates, 4535 articles remained. Article title and abstract were scanned for eligibility; 100 articles were included for full text review, and 28 studies were selected. Figure 1 summarizes the search strategy and selection process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements (Moher *et al.*, 2009; Liberati *et al.*, 2009).

Figure 1 here

Study design and tools used to measure PSC in MCU (Table II)

Assessing PSC was mostly conducted quantitatively using a self-administered questionnaire (n=23). Three studies used a mixed method and only two used a qualitative approach. Abbott *et al.,* (2012) observed staff attitudes in two delivery units, while Currie (2009) used focus group discussions with obstetric unit members to qualitatively assess PSC. Two from three mixed methods aimed to study (or compare) if using both surveys and interviews to examine PSC will have an added benefit (Allen *et al.*, 2010; Freeth *et al.*, 2012). The third mixed method aimed to develop a measurement tool to examine PSC (Milne *et al.*, 2010). Different tools were used to assess PSC, but The Safety Attitudes Questionnaire (SAQ) was most common (n=17). Other tools included Safety Climate Scale (SCS, n=3), Hospital Survey on Patient Safety Culture (HSOPSC, n=2), Cultural Assessment Survey (CAS, n=2), Systematic Culture inquiry on Patient Safety for Primary Care (SCOPE-PC, n=2), and a ten-item survey (n=1). Authors who selected the SAQ to assess PSC attributed their selection to its reliability and validity. Siassakos *et al.,* (2011) stated that SAQ is the only tool that has been validated for assessing healthcare processes with a high reliability. According to Raftopoulos *et al.,* (2011), SAQ Cronbach's alpha is 0.93 representing a reliable tool.

Studying PSC in MCU (Table II)

Examining PSC had two main purposes, to: (a) test the intervention effects on either improving PSC or patient safety/quality outcomes or both (n=17); and (b) examine and compare PSC current status (n=7). A supplementary purpose was to compare between surveys and observations. The intervention types and durations varied between studies; e.g., Marzolf *et al.,* (2015) started a two hours training session for five weeks while Pettker *et al.,* (2009) introduced a comprehensive intervention over four-years.

Studies that tested intervention effectiveness used the change in PSC level alone or combined with other indicators, before and after the intervention. Raab *et al.,* (2013) adopted a comprehensive patient safety program that encompassed several interventions; e.g., conducting a facility review by an independent expert, adopting a new nomenclature, mandating earning a certificate to demonstrate competency, establishing a perinatal team training program, appointing a perinatal nurse to monitor safety initiatives and using a simulation program to improve teamwork and communication. Program success was documented using PSC as a single indicator without reporting other indicators. Pratt *et al.,* (2007) adopted a team training program based on Crew Resources Management (CRM). Other indicators like maternal death, intrapartum and neonatal death, birth trauma and blood transfusion were used as outcomes to evaluate program effectiveness. Another reason for studying PSC was to determine if any extra benefits can be gained by combining surveys with other tools to assess PSC. Allen *et al.,* (2010) used surveys, interviews, and policy audits to examine PSC and concluded that interviews can augment survey results. Freeth *et al.,* (2012) compared two different methods used to examine PSC: surveys and observations. They found that both methods, when compared with observation-based results, were strong, but results from surveys were closer to audit-based results. Milne *et al.,* (2010) and Verbakel *et al.,* (2013) tested and validated a tool used for measuring PSC in MCU and found the new tool to be reliable for examining change in obstetric units.

Cost related to PSC studies

Interventions costs for PSC studies were reported in two studies. Burke *et al.,* (2013) reported that the cost paid for attending the training program was $6300 for nurses and $12000 for obstetricians, which do not cover training itself or other interventions used in the study. Pettker *et al.,* (2009) reported that the interventions had a $210,000 initial cost and $150,000 running annual cost. They claimed that although the intervention cost may be challenging for low-resourced organizations, it outweighs the liability claims. This information is crucial for planners and decision makers. No publication discussed how much it costs to conduct the

study, which could have guided researchers on planning future studies. This narrative review opens the door for future studies to examine PSC assessment and the intervention costs. It might be a challenging task but the process provides guidance for planners and researchers especially for managers with low resources and for those aiming to use PSC as a continuous tool for monitoring.

*Settings, participants and response rate (**Error! Reference source not found.**)*
Studies were conducted in public, community, and academic settings. They were either at national, hospital or unit level. Hospital level studies included MCU along with other hospital departments. No study was conducted at the individual level as PSC reflects the culture within a group. Eleven studies were conducted in the United States, six in the UK and three in Netherlands. The remaining studies were conducted in Japan, Switzerland, Cyprus, Canada, Eritrea, Australia, and Denmark. Studies in this review were published between 2007-2015.

Response rate was reported in 18/23 quantitative studies, which varied greatly from as low as 24% (Verbakel *et al.*, 2014) to as high as 100% (Siassakos *et al.*, 2010). The 100% response rate was reached when participants were handed their questionnaire just before they joined the training sessions. Allen *et al.,* (2010) found that the response rate was highest (100%) when participants were handed the questionnaire individually and the lowest response (21%) was reached when questionnaires were mailed to individuals. According to SAQ guidelines, response rates should typically be between 60% to 70% (Sexton, 2003). In 17 studies that used SAQ, 12 reported the response rate and ten (83%) met the recommended rate (above 60%). Likewise, the HSOPSC recommended response rate is 50% or more (Westat *et al.,* 2016). The only study that reported the response rate using HSOPSC met the recommended rate.

Studies that examined PSC attempted to include MCU multi-professional staff. However, Raftopoulos *et al.,* (2011) was confined to midwives. Two studies described clearly the exclusion criteria for participants. Siassakos *et al.,* (2011) followed the eligibility criteria outlined by Sexton (2003), which states that staff need to be working in the same unit for at least four weeks for 20 hours per week. Similarly, Freeth *et al.,* (2012) excluded students and staff who joined the unit less than four weeks before administering the survey.

Lessons learned from limitations
Authors declared limitations that need to be considered when planning future PSC studies. Fujita *et al.,* (2014) found that cross-sectional studies do not explain the reason for variations in PSC levels across clinical units. Qualitative studies are important if the aim is to explain PSC variations between several departments within a hospital or across hospitals. Despite the additional useful information that can be collected through qualitative studies, assessing PSC quantitatively remains the preferred option if the results are to be generalised and compared across departments or hospitals. Quantitative studies are more useful when improvements are to be followed-up over years.

Generalizing quantitative studies might also be challenged if no actions were taken to minimize selection biases and maximise response rates. Four studies reported that response rates were low, and results may not be representative. Freeth *et al.,* (2012) reported that the response rate was only 27.6%, which limited the study's usefulness. Similarly, Verbakel *et al.,* (2014) attributed the low response rate (24%) to the challenge in finding the professionals addresses while Verbakel *et al.,* (2013) attributed it to time shortages and the professional data being outdated. Allen *et al.,* (2010) reported that the lowest response rate was 21% when surveys were posted to individuals and reached 100% when surveys were handled directly to individuals, which confirms that response rates can be improved by changing the survey distribution method. Guidelines are available on how to maximize the

response rates when using common tools like SAQ and HSOPSC (Westat *et al.*, 2016; Sexton, 2003). Evidence based practices to improve response rate and selection bias needs to be considered when planning any quantitative studies (McColl *et al.*, 2002).

Attributing the change in PSC levels to a specific strategy can be a challenge particularly if the intervention coincided with other unplanned activities like policy change. Riley and Davis (2011) mentioned that their results could be contaminated by other factors like change in policy and personnel. Haller *et al.,* (2008) mentioned other factors that influenced PSC results like differences in staff profile, seasonal differences, resources available between the two assessments, pre-and-post-intervention. Investigators need to be aware and report any changes that may affect PSC levels.

Discussion

Studies included in this review demonstrate that examining PSC in MCU is feasible. Studies show that it is possible to examine PSC in a single MCU; in comparison with other departments within a hospital; or in comparison with other MCUs in other hospitals. However, assessing PSC in MCU with other departments in a hospital has a limited use (Fujita *et al.*, 2014). Hospital wide assessment does not consider the interdepartmental variations and thus does not provide any guidance on the strategy appropriateness to a specific department or unit.

We found that SAQ is the most commonly used questionnaire. The SAQ and HSOPSC methods' popularity was also documented in other reviews like DiCuccio (2015), Halligan and Zecevic (2011), and Morello *et al.,* (2013). Additionally, the psychometric tests (such as item analysis, exploratory factor analysis, confirmatory factor analysis, and Cronbach's alpha) were performed for both tools and they were used for the intra- and inter-institutional comparison (Colla *et al.*, 2005).

Several interventions were used in different settings, which varied in number and duration. Even with comprehensive interventions, a change in PSC is not to be expected a few days after the intervention. Re-assessing PSC should be done after giving time; however, authors have not provided any guidelines for calculating this period. The duration between the intervention and re-examining PSC varied from six months (Ackenbom *et al.*, 2014), 12 months (Haller *et al.*, 2008), 14 months (Channing *et al.*, 2015), 18 months (Wagner *et al.*, 2012), up to four years after implementation (Pratt *et al.*, 2007). Pettker *et al.*, (2009) decided to re-assess PSC twice while implementing the intervention to assess PSC progress with a follow-up study conducted to examine PSC change (Pettker *et al.*, 2011). Although most researchers agreed that assessing PSC level before starting any intervention is important, they disagreed on when PSC should be re-assessed. This issue is further complicated by the reality that protocols, polices and consultants in most hospitals (including units) are in constant changes. Additionally, many other factors act as confounding variables affecting PSC results especially if re-assessment was conducted after a long period from the baseline (Haller *et al.*, 2008). Therefore, the duration between baseline and follow-up assessment needs to be planned. It might be ideal to repeat the PSC every three or six months. However, a three or six month's period might be too early for an intervention to have an effect. Even if one argues that six months is sufficient to notice a change, PSC assessment costs play a crucial factor in planning study frequency. The guidelines for using the SAQ (Sexton, 2003) and the HSOPSC (Westat *et al.*, 2016) did not specify any time period for the follow-up assessment. Therefore, we call for future studies to address this important practical issue.

Although, few studies attempted to estimate PSC intervention costs, these estimations were neither complete nor specific enough to inform decision makers and planners. Additionally, no paper estimated PSC assessment costs. Therefore, we call for future studies to report PSC assessment intervention costs.

Limitations

Our review has limitations. First, publications were screened by a single reviewer, which may increase bias in selecting the related studies. Second, it is possible that where results were inconclusive or were negative, researchers may have not published their studies, or they were not accepted for publication. This introduces a potential threat for publication bias. Third, grey literature was not considered. Conclusions drawn from this review, therefore, may be biased. Despite these limitations, we believe that our conclusions are valid because attempts were made to ensure the review's comprehensiveness via eight databases.

Conclusions

Improving maternity services is an international priority. Improving PSC is linked with a significant effect on patient outcomes. We summarized the international efforts for examining MCU PSC. It is a step towards improving MCU safety. Examining PSC either in MCU alone or in combination with other departments is feasible. Additionally, evaluating PSC level can act as a tool to evaluate intervention effects both on PSC and patient outcomes. The lessons learned from the limitations need to be considered before executing any PSC study. Additionally, quantitative studies permit PSC results generalisability and comparability while qualitative studies are useful to explain variations in results. Importantly, the intervention number and duration varied greatly and both extremes had a significant improvement in PSC. Therefore, selecting an evidenced based strategy specific to MCU is an essential step to increase success. Finally, we call for future research on: (i) how soon PSC should be re-examined after an intervention; (ii) reporting the interventions costs that aim to improve MCU PSC; and (iii) assessing PSC studies costs.

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Table I: Review protocol

	Inclusion criteria	**Exclusion criteria**
Population	Maternity units, Obstetrics units, Pre and post-natal departments, Midwifery, Community and hospitals	Other health services
Intervention	Assessment of PSC	Organizational culture Patient safety outcomes
Comparator	None	
Outcomes	PSC assessment tools, response rates, purposes of the assessment.	
Study	Qualitative, quantitative and mixed Published in English before 2016	Grey literature

Table II: Extracted and synthesised data table (tools, design, purpose, and intervention)

Author	Tool used to assess safety culture				Study design			Purpose			Interventions	
	SAQ	**SCS**	**HSOPSC**	**Others (CAS, SCOPE-PC)**	**Qualitative**	**Quantitative**	**Mixed**	**Assessing PSC**	**Assess effectiveness of intervention**	**Methodological (assessment/development of measurement tools)**	**Yes**	**No**
(Abbott *et al.*, 2012)					√							√
(Ackenbom *et al.*, 2014)				√		√			√		√	
(Allen *et al.*, 2010)	√	√					√			√		√
(Burke *et al.*, 2013)			√			√			√		√	
(Channing *et al.*, 2015)	√					√			√		√	
(Currie, 2009)					√			√				√
(Freeth *et al.*, 2012)		√					√			√		√
(Fujita *et al.*, 2014)			√			√		√				√
(Haller *et al.*, 2008)	√					√			√		√	
(Lavery *et al.*, 2014)				√		√			√		√	
(Martijn *et al.*, 2013)	√					√		√				√
(Marzolf *et al.*, 2015)	√					√			√		√	
(Miller *et al.*, 2008)	√					√			√		√	
(Milne *et al.*, 2010)				√			√			√		√
(Pettker *et al.*, 2009)	√					√		√	√		√	
(Pettker *et al.*, 2011)	√					√			√		√	
(Pratt *et al.*, 2007)	√					√			√		√	
(Raab *et al.*, 2013)	√					√			√		√	
(Raftopoulos *et al.*, 2011)	√					√		√				√
(Riley and Davis, 2011)	√					√			√		√	
(Shoushtarian *et al.*, 2014)	√					√			√		√	
(Siassakos *et al.*, 2010)	√					√			√		√	
(Siassakos *et al.*, 2011)	√					√		√				√
(Simpson *et al.*, 2011)	√					√			√		√	
(Sørensen *et al.*, 2013)	√					√			√		√	
(Verbakel *et al.*, 2014)				√		√		√				√
(Verbakel *et al.*, 2013)				√		√				√		√
(Wagner *et al.*, 2012)		√				√			√		√	
Total	**17**	**3**	**2**	**5**	**2**	**23**	**3**	**7**	**17**	**4**	**17**	**11**

*__SAQ__: Safety Attitude Questionnaire, __SCS__: Safety Climate Scale**,** __HSOPSC__: Hospital Survey on Patient Safety Culture, __CAS__: Cultural Assessment Survey, __SCOPE-PC__: Systematic Culture inquiry On Patient Safety for Primary Care, __PSC__: Patient Safety Culture

Appendix I: Search strategy used in Medline and applied to other databases

#	Query	Results
S21	S11 AND S16 AND S19 (limit to Journal article, English language)	2,767
S20	S11 AND S16 AND S19	2,899
S19	S17 OR S18	446,143
S18	"patient safety"	29,080
S17	"safety"	446,143
S16	S12 OR S13 OR S14 OR S15	2,194,841
S15	"behavior*"	1,182,717
S14	"attitude*"	349,418
S13	"climate"	76,622
S12	"culture"	714,657
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	1,221,897
S10	"pregnancy"	846,587
S9	"antenatal"	27,958
S8	"postnatal"	91,562
S7	"perinatal"	69,024
S6	"midwif*"	37,362
S5	"reproductive care"	268
S4	"reproductive health service*"	2,359
S3	"gyn*cology"	251,779
S2	"obstetric*"	353,191
S1	"matern*"	299,442

Appendix II: Data extraction table showing country, response rate, setting, and participants

Author	Country				Response rate	Met the criteria for SAQ*** survey (above 60%)		Setting	Participants
	US*	UK **	Netherlands	Others		Yes	No		
(Abbott *et al.*, 2012)		√			NA	NA	NA	2 Hospital (delivery units)	All staff observed
(Ackenbom *et al.*, 2014)	√				62% (before) and 52% (after)	NA	NA	One Hospital (labor and delivery)	All labour and delivery staff (169)
(Allen *et al.*, 2010)				√	28%		√ (SAQ)	One maternity service in two public hospitals	All staff who are regularly working in Maternity service (210)
(Burke *et al.*, 2013)	√				Not reported	NA	NA	Large university hospital (labor and delivery unit)	380 all staff
(Channing *et al.*, 2015)		√			82% (baseline), 67% (post-intervention)	√ (SAQ)		1 Hospital (gynaecology unit)	All staff in gynaecology unit
(Currie, 2009)		√			NA	NA	NA	1 hospital (Obstetric unit)	33 (5 senior midwifery managers, 6 community midwives, 17 midwifery students and 5 midwifery support staff)
(Freeth *et al.*, 2012)		√			27.6% (range: 9-47%)			8 hospitals (16 units: Emergency Department and Delivery Unit)	All staff (excluded: students and staff joining less than 4 weeks),
(Fujita *et al.*, 2014)				√	75.60%			18 Hospitals (all units)	All staff (12,076)
(Haller *et al.*, 2008)				√	94.90%	√ (SAQ)		University-affiliated hospital (Obstetric department)	239 (Nurses, physicians, midwives, and technicians from the clinics of anaesthesia, obstetrics, and paediatrics)
(Lavery *et al.*, 2014)	√				Not reported			17 hospitals	14400 (physicians, midwives, nurses and other staff)
(Martijn *et al.*, 2013)			√		88%	√ (SAQ)		70 primary practices: General practice, General dental practice, midwifery	A total of 80 practices (general practices, general dental practices, midwifery

Author	Country				Response rate	Met the criteria for SAQ*** survey (above 60%)		Setting	Participants
	US*	UK **	Netherlands	Others		Yes	No		
								practice and allied health practice	practices allied and health care practices)
(Marzolf *et al.*, 2015)				√	77.6% (before training), 95.6% (after training)	√(SAQ)		Maternity Hospital	All full time clinical staff
(Miller *et al.*, 2008)	√				Not reported			6 Hospitals (Obstetric and neonatal emergencies)	700 (physicians, nurses, and support staff)
(Milne *et al.*, 2010)				√	47.7% (in the first phase), 62.9% (in the third phase)			11 hospitals (Obstetrics and gynaecology)	Pre-piloting through 300 questionnaires, 21 interviews, and 9 focus group discussions. Piloting: 350 surveys and 12 interviews
(Pettker *et al.*, 2009)	√				89%, 95% and 94%	√(SAQ)		2 Hospitals (Obstetric units only)	All medical staff and employee involved in obstetrics care
(Pettker *et al.*, 2011)	√				89%, 95%, 94%, 72%	√(SAQ)		Hospitals (Obstetric units only)	All medical staff and employee involved in obstetrics care
(Pratt *et al.*, 2007)	√				Not reported			A tertiary academic obstetric department	220 (all clinical staff)
(Raab *et al.*, 2013)	√				72%	√(SAQ)		3 academic Hospitals (Obstetrics care units)	210 obstetric staff
(Raftopoulos *et al.*, 2011)				√	75.71%	√(SAQ)		5 regional public hospitals (maternity units)	140 midwifes
(Riley and Davis, 2011)	√				Not reported			3 small size Community hospitals	All Obstetricians, paediatrician, general practitioners, nurses and midwifes
(Shoushtarian *et al.*, 2014)				√	47.6% (before training), 45.9% (after training)		√ (SAQ)	8 public hospitals (maternity units)	933 staff (total before and after PROMPT)

Author	Country				Response rate	Met the criteria for SAQ*** survey (above 60%)		Setting	Participants
	US*	UK **	Netherlands	Others		Yes	No		
(Siassakos *et al.*, 2010)		√			100%	√(SAQ)		6 maternity units	114 maternity professionals (19 teams of six members; one senior and one junior obstetrician; two senior and two junior midwives)
(Siassakos *et al.*, 2011)		√			69%	√(SAQ)		One maternity unit	132 (all staff who worked in maternity units for 4 weeks for 20 hours or more per week)
(Simpson *et al.*, 2011)	√				Not reported			15 hospitals (perinatal teams)	Obstetricians, physicians, midwives.
(Sørensen *et al.*, 2013)				√	Not reported			One hospital (Obstetric centre)	100 (all health professionals in the department)
(Verbakel *et al.*, 2014)			√		24%			Three hundred and thirteen practices (9 primary care profession: dental care, dietetics, exercise therapy, physiotherapy, occupational therapy, midwifery, anticoagulation clinics, skin therapy and speech therapy	1200 (all clinical staff)
(Verbakel *et al.*, 2013)			√		38.40%			Primary (all professions including midwifes)	2400 (all clinical staff)
(Wagner *et al.*, 2012)	√				Not reported			Large tertiary care medical centre (obstetrics unit)	217 during implementation, 1731 after implementation
Total	**11**	**6**	**3**	**8**	**18/23 (out of quantitative studies)**	**10/12 for SAQ**	**2/12 for SAQ**		

*__US__: United States **__UK__: United Kingdom ***__SAQ__: Safety Attitude Questionnaire

Figure 1: Search strategy and selection process PRISMA flow chart