






# BMJ Open Quality Patient safety incident reporting systems and reporting practices in African healthcare organisations: a systematic review and meta-analysis

Gelana Fekadu <sup>1,2</sup>, Rachel Muir <sup>1,3,4</sup>, Georgia Tobiano <sup>5,6</sup>,  
Michael J Ireland <sup>7</sup>, Melaku Tadege Engidaw <sup>8,9</sup>, Andrea P Marshall <sup>1,6</sup>

**To cite:** Fekadu G, Muir R, Tobiano G, *et al.* Patient safety incident reporting systems and reporting practices in African healthcare organisations: a systematic review and meta-analysis. *BMJ Open Quality* 2025;**14**:e003202. doi:10.1136/bmj-2024-003202

► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/bmj-2024-003202>).

Received 30 October 2024  
Accepted 13 February 2025



© Author(s) (or their employer(s)) 2025. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ Group.

For numbered affiliations see end of article.

## Correspondence to

Gelana Fekadu;  
fekadugelana4@gmail.com

## ABSTRACT

**Background** Patient safety incident reporting and learning systems are crucial for improving the safety and quality of healthcare. However, comprehensive evidence of their availability and use in African healthcare organisations is lacking. Therefore, this review aims to synthesise the existing literature on these systems and reporting practices within African healthcare organisations.

**Methods** A systematic review and meta-analysis were conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Five electronic databases, including PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL) via EBSCOhost, Scopus, Web of Science and the Excerpta Medica Database (Embase), were searched to identify relevant records. Peer-reviewed articles and guidelines published in English were included in this review. Quality appraisal was performed using the Joanna Briggs Institute and Quality Assessment with Diverse Studies tool. A random effects model was used to compute the pooled prevalence using Stata V.17.0.

**Results** A systematic search retrieved 9279 records, of which 39 (36 articles and 3 guidelines) were included in this review. Eight patient safety incident reporting and learning systems were identified, with compliance rates ranging from low (16%) to high (87%) based on the WHO criteria. The pooled prevalence of patient safety incident reporting practices was 48% (95% CI 40% to 56%). However, the studies exhibited high heterogeneity ( $I^2=98.75\%$ ,  $p<0.001$ ).

**Conclusion** In African healthcare organisations, it is imperative to establish robust patient safety incident reporting and learning systems, as none of the existing systems fully meet WHO criteria. In addition, optimising the existing systems and encouraging healthcare professionals to improve reporting practices will enhance patient safety and outcomes.

**PROSPERO registration number** CRD42023455168.

## BACKGROUND

Patient safety incidents are defined as deviations from standard healthcare practices that may result in unnecessary harm to patients.<sup>1</sup> These incidents are categorised as harmful, non-harmful or near-misses based on their severity.<sup>2</sup> They significantly contribute

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Patient safety incident reporting and learning systems are essential for promoting learning from incidents and preventing recurrences.
- ⇒ The WHO has issued guidelines to standardise patient safety incident reporting and learning systems.

## WHAT THIS STUDY ADDS

- ⇒ Provides the first comprehensive literature review of patient safety incident reporting and learning systems in African healthcare, revealing low to high levels of compliance with WHO criteria.
- ⇒ Identifies suboptimal reporting rates among healthcare professionals in African healthcare.
- ⇒ Highlights the limited involvement of patients and their families in incident reporting processes within African healthcare.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Recommends that future studies in Africa to evaluate the impact of reporting systems on patient safety and explore strategies for effective patient and family involvement using evidence-based frameworks.
- ⇒ Offers critical insights to inform policies aimed at developing and improving patient safety incident reporting and learning systems in Africa and similar healthcare contexts.

to preventable morbidity, mortality and economic burden in contemporary healthcare systems.<sup>3 4</sup> Appropriate reporting can transform these incidents into valuable learning opportunities, thereby preventing their recurrence and enhancing safety culture.<sup>5–7</sup> Patient safety incident reporting and learning systems are essential elements of clinical risk management and quality improvement.<sup>8</sup> These systems provide a structured approach for collecting and analysing detailed data regarding patient safety incidents, identifying contributing factors and informing targeted interventions to enhance patient safety and healthcare quality.<sup>9 10</sup>

Furthermore, an effective reporting system strengthens healthcare system resilience, fosters collaboration among healthcare professionals, and enables them to share experiences and address immediate safety concerns.<sup>5 11</sup>

Reason's Swiss cheese model highlights how latent conditions-flaws or weaknesses that exist within healthcare systems, can align with active failures or errors made by individuals to create conditions where patient harm is more likely to occur.<sup>12</sup> This model emphasises the importance of focusing on system-level improvements rather than attributing blame to individual staff members when addressing healthcare errors.<sup>13</sup> In 2005, the WHO released the first guidelines for patient safety incident reporting and learning systems, outlining its essential components and standardising their implementation.<sup>14</sup> In 2016, a minimal information model for patient safety was introduced, which specified the requisite information to be included in patient safety incident reports.<sup>15</sup> Consequently, it is imperative to adopt and implement the patient safety incident reporting and learning systems to align with the WHO criteria for effective and efficient utilisation.<sup>14</sup> These systems are widely adopted in various high-income countries (HICs).<sup>16–20</sup> While deriving insights from the success of these systems in HICs is valuable, it is equally important to design and implement context-sensitive systems in low-resource settings, such as those in Africa.<sup>21</sup> Additionally, developing and evaluating locally effective, economically viable and evidence-based patient safety solutions are vital in these settings despite the limited available evidence.<sup>22</sup>

To the best of our knowledge, only one systematic review has compared the patient safety incident reporting and learning systems with WHO criteria, focusing exclusively on intensive care units in HICs.<sup>23</sup> Although other reviews have estimated the rate of patient safety incident reporting among healthcare professionals, none have included articles from Africa.<sup>24 25</sup> No systematic review has compared the available patient safety incident reporting systems in African healthcare organisations against WHO criteria or estimated the rate of patient safety incident reporting practices in these settings. Therefore, through this review, we aim to address the following research questions: to what extent do the available patient safety incident reporting and learning systems in African healthcare organisations align with the WHO criteria, and what is the pooled prevalence of patient safety incident reporting practices among healthcare professionals in these settings?

## METHODS

A systematic review and meta-analysis was conducted to synthesise the available literature on patient safety incident reporting and learning systems, estimate the pooled prevalence of patient safety incident reporting practices among healthcare professionals in African healthcare organisations, and identify research gaps. This review was guided by the Joanna Briggs Institute (JBI) manual of evidence

synthesis for prevalence data.<sup>26</sup> Additionally, other methodological studies informed this review to ensure methodological rigour, minimise biases and enhance the reliability of the findings. Borges Migliavaca *et al* provided specific guidance on handling prevalence data and addressing heterogeneity.<sup>27</sup> Muka *et al*'s comprehensive 24-step guide on structured approaches for conducting systematic reviews and meta-analyses, informed handling data synthesis and quality assessment.<sup>28</sup> Tawfik *et al*'s step-by-step guide provided valuable insights into data handling and statistical analysis approaches.<sup>29</sup> These methodological frameworks complement one another in ensuring comprehensive coverage of different aspects of the review process, from data extraction to synthesis.

We adhered to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines for reporting of this study.<sup>30</sup>

## Information source and search strategy

A systematic search strategy was formulated in collaboration with specialist health science librarians. Five electronic databases, PubMed, Cumulative Index to Nursing and Allied Health Literature via EBSCOhost, Scopus, Web of Science and Embase, were searched to identify potentially eligible articles. The initial search was conducted on 17 September 2023, and the follow-up search was conducted on 13 February 2024. A combination of keywords and Medical Subject Headings linked with Boolean operators “AND/OR” was used (online supplemental file 1). A comprehensive manual search for the patient safety incident reporting and learning systems guidelines were conducted using search engines such as Google and relevant government websites. The search involved specific terms such as ‘patient safety incident reporting systems guidelines’, ‘patient safety reporting and learning system policies’ and ‘protocol for patient safety incident reporting and learning’, combined with the names of each African country. Articles that met the eligibility criteria after a full-text review underwent a backwards citation search to identify additional relevant articles.

## Inclusion and exclusion criteria

Articles were included if they described and examined patient safety incident reporting and learning systems and/or practices among healthcare professionals in African healthcare organisations. Articles published in English, regardless of the publication year or study design, were considered. Additionally, guidelines related to patient safety incident reporting and learning systems published in English were included. Exclusion applied to articles and guidelines addressing adverse drug reactions or immunisation side effects. Commentaries, expert opinions, letters to editors, abstracts from scientific meetings, and study protocols were excluded.

## Selection process

Following the systematic search, all retrieved records were imported into Covidence software (Covidence,

Melbourne, Victoria), which automatically removed duplicates. Any remaining duplicates that were not captured during this process were removed manually. Titles and abstracts were independently screened by two authors, GF and MTE, based on the predefined eligibility criteria. Discrepancies were resolved through consultation with APM. A full-text review of the selected articles was independently performed by GF and APM, adhering to the same eligibility criteria. Any disagreements were addressed in consultation with either RM or GT.

### Data extraction

For the first review question, 'To what extent do available patient safety incident reporting and learning systems in African healthcare organisations align with WHO criteria?'. A custom data extraction template was developed by the study team drawing on the research questions, the systematic review by Brunsveld-Reinders *et al.*,<sup>23</sup> the WHO's 'Draft guidelines for adverse event reporting and learning systems',<sup>14</sup> and the 'Advanced minimal information model for patient safety incident reporting and learning systems: user guide'.<sup>15</sup> For simplicity, both sets of guidelines are referred to as 'WHO criteria' in this study. To address the second review question 'What is the pooled prevalence of patient safety incident reporting practices among healthcare professionals in African healthcare organisations?', the data extraction template was prepared based on the review questions. Both templates were piloted with five articles each, refined to capture all pertinent data, and then used for full data extraction. An accuracy of 20% of the extracted data was verified by GT or RM, after which GF made the necessary revision based on the feedback received.

### Quality appraisal

The JBI quality appraisal tools were used to assess the articles with qualitative and quantitative methods.<sup>31</sup> Additionally, the Quality Assessment with Diverse Studies tool was used to evaluate articles with mixed methods.<sup>32</sup> GF primarily conducted the quality appraisal with GT or RM verifying 20% and providing feedback. Articles were categorised into three groups based on the percentage of quality criteria met: low (<50% of criteria met), moderate (50%–75% of criteria met) and high quality (>75% of criteria met). The outcomes of the quality assessments were used to describe the quality of the articles included in the review. However, no articles were excluded based on these scores.

### Synthesis methods and statistical analysis

The extent to which the available patient safety incident reporting and learning systems in African healthcare organisations align with the WHO criteria was textually described, and the level of compliance was calculated as high (>80% of criteria met), medium (50%–80% of criteria met) and low (<50% of the criteria met). To determine the pooled prevalence of patient safety incident reporting practices, the extracted data were imported to

Stata/MP V.17.0 (Stata Corp, Texas) for meta-analysis. The pooled prevalence was calculated using a random effects model (events/sample size) to account for the variability among the included articles and displayed in a forest plot. Heterogeneity was assessed using the  $I^2$  statistic. Owing to the high heterogeneity observed, a subgroup analysis was conducted based on study design and country. Publication bias was assessed using a funnel plot for asymmetry and Egger's statistical test ( $p < 0.05$ ).

## RESULTS

### Selection of articles and guidelines

Overall, the search identified 9279 records. After screening by title and abstract and then full text, 39 records (36 articles and 3 guidelines) were included in the review, as illustrated in figure 1.

### Characteristics of articles and guidelines

Geographically, the records were from nine African countries, with one article being multinational. Of these, 31 (79.4%) were from Ethiopia, Egypt, Nigeria and South Africa. The majority (86%) of articles were quantitative in design (figure 2). Of the 36 articles, 28 (77.7%) were included in the meta-analysis to estimate the pooled prevalence of patient safety incident reporting practices. These articles represented the perspectives of 10 324 healthcare professionals working in more than 103 hospitals with various capacities in Africa, as depicted in table 1.

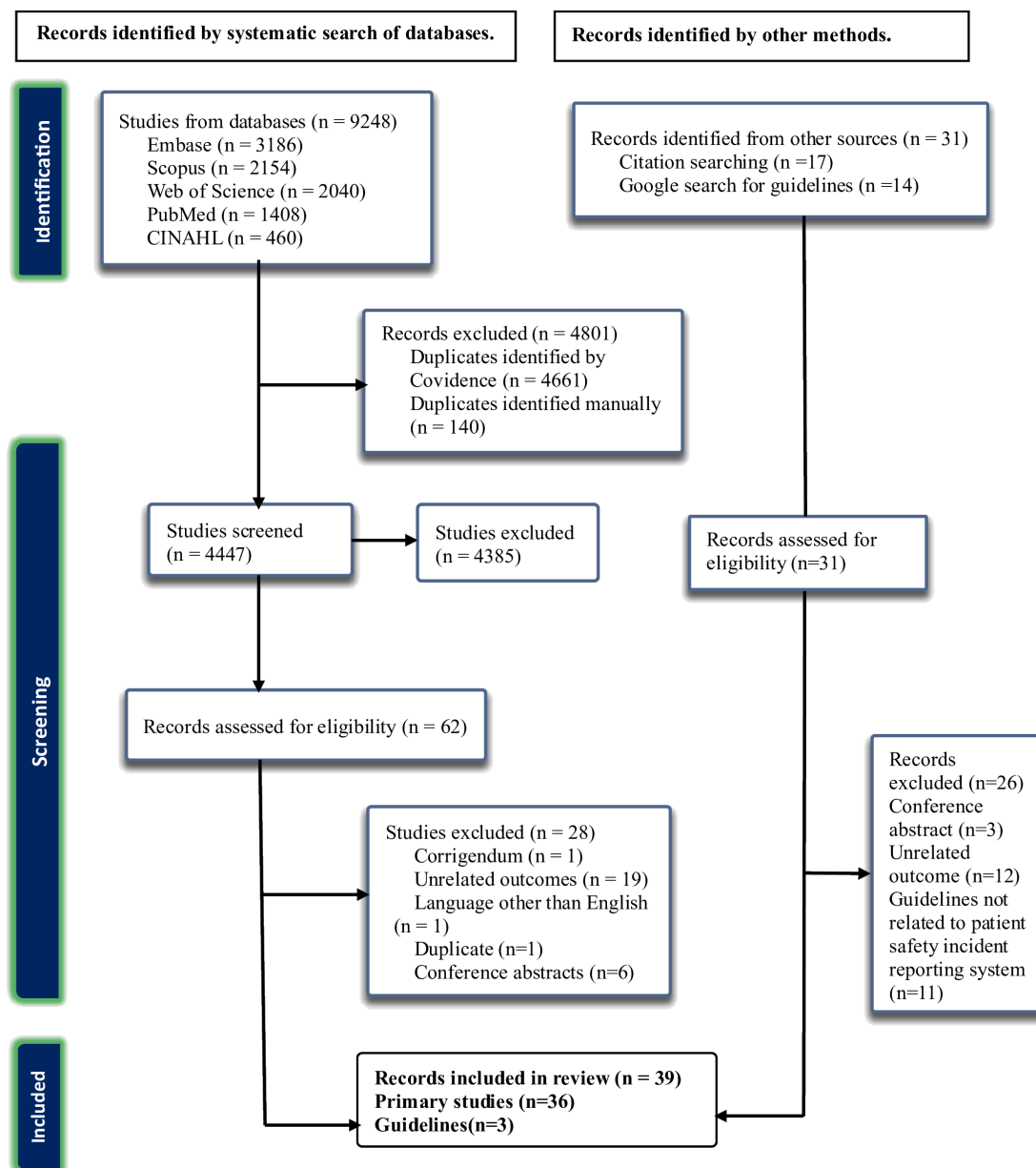
### Quality appraisal

Study quality varied, and based on the quality appraisal scores, 19 articles (52.8%) were of high quality, 15 articles were of moderate quality and 2 articles (5.5%) were of low quality. A summary of the quality appraisal scores is provided in online supplemental file 2.

### Assessment of the patient safety incident reporting and learning systems against WHO criteria

Eight articles<sup>33–40</sup> and three guidelines<sup>41–43</sup> provided details on eight patient safety incident reporting and learning systems available in African healthcare organisations. None of these systems completely fulfilled all WHO criteria. Of the eight systems, five focused on specific clinical units or incident types, while three were broad, covering multiple clinical units and incident types (table 2).

The focused systems demonstrated low to medium levels of adherence with WHO criteria. The Egyptian Neonatal Safety Training Network (E-NSTN)<sup>34</sup> and the Tunisian Adverse Event Reporting Systems (T-AERS), designed for intensive care units,<sup>39</sup> achieved medium compliance levels of 79% and 66%, respectively. The Zimbabwe Critical Incident Reporting Systems (Z-CIRS) targeted the operating theatre and anaesthesia units in two teaching hospitals, reaching a medium (53%) compliance level.<sup>33</sup> For medication error reporting, the Egyptian National Online Medication Error Reporting System (E-NOMERS)<sup>37</sup> and Zambian Medication Error



**Figure 1** Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.

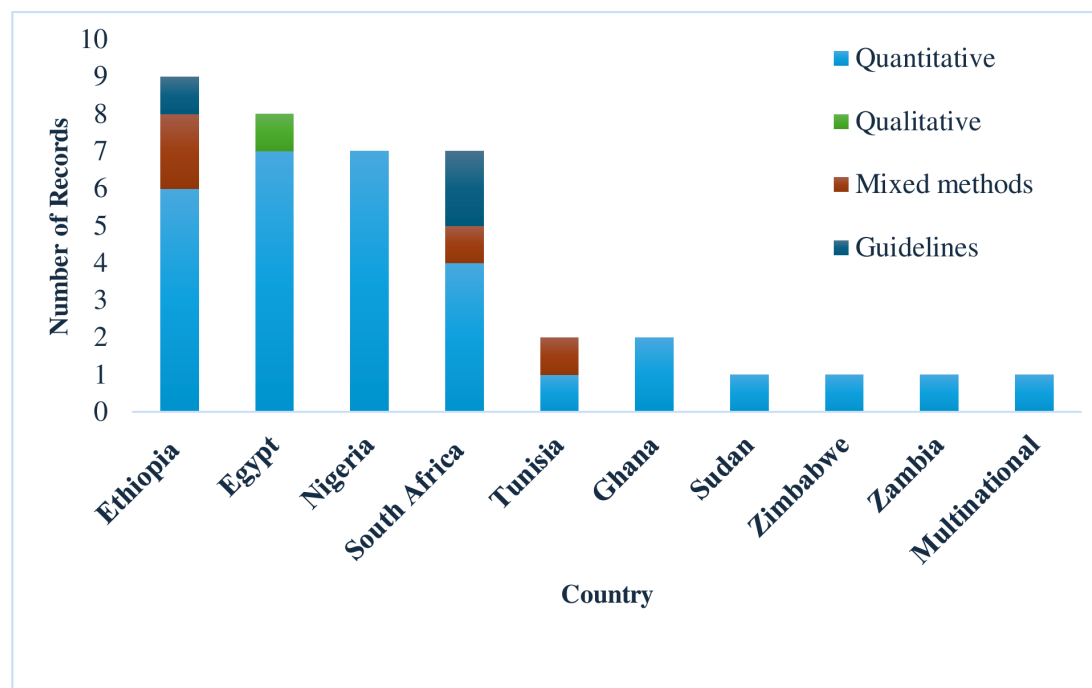
Reporting Systems (Z-MERS),<sup>35</sup> achieved medium (58%) and low (16%) levels of compliance, respectively.

Among the three broader-based reporting systems, the South African Patient Safety Incident Reporting and Learning Systems (SA-PSIRLS) exhibited varying levels of compliance. Earlier guidelines and published articles met 34%–39% of the WHO criteria,<sup>38 43 44</sup> while the updated guidelines demonstrated a significantly high compliance rate of 87%.<sup>41</sup> The Médecins Sans Frontières Medical Error Reporting Systems (MSF-MERS), implemented in 11 African countries, achieved a medium compliance level of 74%.<sup>36</sup> In contrast, the Ethiopian Hospital Services Transformation Guidelines (E-HSTG) achieved a lower compliance rate of 26%.<sup>42</sup> The primary objective of all the systems is to promote learning and improve patient safety.

Two guidelines from South Africa and one from Ethiopia were identified through manual searches. These include the adverse event monitoring and reporting guidelines of the KwaZulu National Department of Health,<sup>43</sup> national guidelines for SA-PSIRLS,<sup>41</sup> and E-HSTG.<sup>42</sup> The national guidelines for SA-PSIRLS are currently in use, and the country has formal reporting systems.<sup>41</sup> In contrast, the E-HSTG emphasises the need for hospitals to implement reporting systems but lacks detailed procedures and frameworks. As a result, there is no evidence of the implementation of patient safety incident reporting systems or the publication of related reports from Ethiopian healthcare.<sup>42</sup>

The patient safety incident reporting and learning systems incorporate various criteria mentioned in WHO guidelines.<sup>14 15</sup> These are grouped as data input, data





**Figure 2** Geographical distribution of records included in a systematic review and meta-analysis on patient safety incident reporting systems and practices in African healthcare organisations.

collection, implementation, data analysis and feedback, as outlined in [table 2](#).

#### Data input

According to the WHO criteria, reporting incidents should be voluntary, which was explicitly mentioned in seven of eight (87.5%) reporting systems.<sup>33–37 39 41</sup> Confidentiality, a crucial aspect of WHO criteria, was ensured for patients, reporters and organisations in E-NSTN<sup>34</sup> and SA-PSIRLS.<sup>38 40 41</sup> Z-CIRS,<sup>33</sup> MSF-MERS<sup>36</sup> and T-AERS,<sup>39</sup> guaranteed confidentiality only for patients and reporters. E-NOMERS<sup>37</sup> and E-HSTG emphasised the confidentiality of reporters.<sup>42</sup> Regarding methods of reporting, E-NSTN<sup>34</sup> and E-NOMERS<sup>37</sup> used relational databases. SA-PSIRLS incorporated both online and human receivers.<sup>38 40 41 43</sup> The Z-CIRS,<sup>33</sup> MSF-MERS,<sup>36</sup> T-AERS<sup>39</sup> and E-HSTG<sup>42</sup> outlined human receivers.

#### Data collection

The systems included in this review used various terms to describe the reported patient safety incidents. For instance, the E-NSTN<sup>34</sup> and SA-PSIRLS used the terms ‘incidents’ and ‘errors’.<sup>38 40 41 43</sup> Z-CIRS mentioned ‘critical incidents’,<sup>33</sup> E-NOMERS<sup>37</sup> and Z-MERS<sup>35</sup> specifically focused on ‘medication errors’, while T-AERS<sup>39</sup> and E-HSTG used the term ‘adverse events’.<sup>42</sup> The MSF-MERS,<sup>36</sup> specifically focused on ‘medical error’. Healthcare professionals could report in all systems, whereas only SA-PSIRLS,<sup>41</sup> E-NSTN<sup>34</sup> and Z-MERS<sup>35</sup> involved patients and families as reporters.

#### Implementation

Implementation approaches, such as providing training, introducing the patient safety incident reporting and

learning systems to staff, and promoting the use of systems have been reported in five (62.5%) systems; specifically, Z-CIRS,<sup>33</sup> E-NOMERS,<sup>37</sup> SA-PSIRLS,<sup>41</sup> MSF-MERS<sup>36</sup> and T-AERS.<sup>39</sup>

#### Data analysis

Multiple data analysis approaches are described in the WHO criteria as detailed in [table 2](#). Classification by event type, risk and causation were included in the E-NSTN,<sup>34</sup> Z-CIRS,<sup>33</sup> MSF-MERS<sup>36</sup> and T-AERS.<sup>39</sup> E-NOMERS<sup>37</sup> and SA-PSIRLS<sup>41</sup> include classifications by event type only. Data analysis approaches, including data summaries and descriptions, causal analysis, system-oriented analysis and contributing factors, have been reported in E-NSTN.<sup>34</sup> Two articles highlighted the use of root cause analysis within SA-PSIRLS.<sup>38 40</sup> Expert evaluation of the reported data was explicitly addressed within only four (50%) of eight systems: E-NSTN,<sup>34</sup> SA-PSIRLS,<sup>41</sup> MSF-MERS<sup>36</sup> and T-AERS.<sup>39</sup> Two guidelines from South Africa described the timeframe, varying from 24 hours<sup>41</sup> to 48 hours<sup>43</sup> for the analysis of severe incidents. However, detailed data analysis procedures have not been outlined in the E-HSTG.<sup>42</sup>

#### Feedback

The WHO guidelines underlined the importance of feedback on reports, which were addressed in five systems (62.5%): E-NSTN,<sup>34</sup> Z-CIRS,<sup>33</sup> SA-PSIRLS,<sup>41</sup> MSF-MERS<sup>36</sup> and T-AERS<sup>39</sup> through alerts, forum presentations and review meetings. In E-NSTN<sup>34</sup> and SA-PSIRLS,<sup>41</sup> agencies receiving reports offered recommendations for improvement based on data analysis. MSF-MERS further discussed system improvements, including protocol changes and enhanced field-level practices, such as training for staff,

**Table 1** Summary of articles included meta-analysis of pooled prevalence of patient safety incident reporting practices in African healthcare organisations.

No.	Author, publication year	Country	Study design	Hospitals (n)	Sample size	Rates of patient safety incident reporting
1	Abdalla <i>et al</i> (2020) <sup>78</sup>	Sudan	CS	01	191	153 (80%)
2	Abuosi <i>et al</i> (2022) <sup>79</sup>	Ghana	CS	13	1651	1149 (69.6%)
3	Afolalu <i>et al</i> (2021) <sup>80</sup>	Nigeria	CS	01	230	115 (50%)
4	Alemu <i>et al</i> (2017) <sup>81</sup>	Ethiopia	CS	02	141	35 (24.7%)
5	Alhassan <i>et al</i> (2022) <sup>82</sup>	Ghana	CS	03	210	78 (37.3%)
6	Aouicha <i>et al</i> (2022) <sup>83</sup>	Tunisia	MM	02	297	42 (14.1%)
7	Asefa <i>et al</i> (2021) <sup>84</sup>	Ethiopia	CS	03	224	85 (37.5%)
8	Balogun <i>et al</i> (2019) <sup>85</sup>	Nigeria	CS	01	92	74 (80.4%)
9	Bifftu <i>et al</i> (2106) <sup>86</sup>	Ethiopia	CS	01	282	82 (29.1%)
10	Blignaut <i>et al</i> (2022) <sup>87</sup>	South Africa	MM	08	295	198 (67.1%)
11	Ragab Dorgham and Khamis Mohamed (2012) <sup>88</sup>	Egypt	CS	01	90	66 (73.3%)
12	El-Sayed <i>et al</i> (2022) <sup>89</sup>	Egypt	QE	01	100	42 (42%)
13	Eshete <i>et al</i> (2021) <sup>90</sup>	Ethiopia	CS	04	288	92 (31.9%)
14	Gqaleni and Bhengu (2020) <sup>44</sup>	South Africa	CS	10	224	188 (84%)
15	Eltaybani <i>et al</i> (2019) <sup>91</sup>	Egypt	Q	02	112	61 (54.3%)
16	Ogunleye <i>et al</i> (2016) <sup>92</sup>	Nigeria	CS	10	2386	847 (35.5%)
17	Oshikoya <i>et al</i> (2013) <sup>93</sup>	Nigeria	CS	07	50	15 (30%)
18	Wami <i>et al</i> (2016) <sup>94</sup>	Ethiopia	MM	04	596	185 (31%)
19	Yalew and Yitayew (2021) <sup>95</sup>	Ethiopia	MM	01	291	36 (12.4%)
20	Youssef Elshoura and Mosallam (2022) <sup>96</sup>	Egypt	CS	19	112	68 (60.7%)
21	Zoghby <i>et al</i> (2021) <sup>97</sup>	South Africa	CS	01	100	43 (43%)
22	Agegnehu <i>et al</i> (2019) <sup>98</sup>	Ethiopia	CS	UC	579	176 (30.4%)
23	Araby <i>et al</i> (2018) <sup>99</sup>	Egypt	CS	01	257	62 (66.7%)
24	Brotobor <i>et al</i> (2021) <sup>45</sup>	Nigeria	CS	01	416	416 (100%)
25	Aly <i>et al</i> (2013) <sup>100</sup>	Egypt	CS	01	204	80 (39.2%)
26	Jember <i>et al</i> (2018) <sup>101</sup>	Ethiopia	CS	03	397	288 (57.4%)
27	Udi <i>et al</i> (2019) <sup>102</sup>	Nigeria	CS	01	259	195 (75.3%)
28	Ilesanmi <i>et al</i> (2016) <sup>103</sup>	Nigeria	CS	01	250	158 (63.2%)

CS, cross-sectional; MM, mixed method; Q, qualitative; QE, quasi-experimental; UC, unclear.

supervision, staffing adjustments and medication procedures, such as double-checking medications and reorganising pharmacy stock<sup>36</sup> as specified in [table 2](#).

### Pooled prevalence of patient safety incident reporting practices

28 articles were included to generate the pooled prevalence of patient safety incident reporting practices among healthcare professionals in Africa, while one article<sup>45</sup> with an SE of zero was excluded from the analysis (online supplemental file 3). In the random effects model (which accounts for variability among

the included studies), the pooled prevalence was 48% (95% CI 40% to 56%), with significant heterogeneity observed among the studies ( $I^2=98.75\%$ ,  $p<0.001$ ). This finding indicates substantial differences in reporting practices beyond what would be expected by chance. The pooled prevalence in the fixed effects model was consistent at 46% (95% CI 45% to 47%), with no heterogeneity (0%). However, given the considerable heterogeneity detected in the random-effects model, the fixed-effects model may not be the most appropriate for interpreting these data ([figure 3](#)).

**Table 2** WHO criteria and patient safety incident reporting and learning systems in African healthcare organisations.

Name of reporting systems and citations		SA-PSIRLS								MSF-MERS <sup>36</sup>	T-AERS <sup>39</sup>	Z-MERS <sup>35</sup>	E-HSTG <sup>42</sup>
		E-NSTN <sup>34</sup>	Z-CIRS <sup>33</sup>	E-NOMER <sup>37</sup>	40	38	41	43					
Data input	Is reporting voluntary?	Y	Y	Y	–	–	Y	–	Y	Y	Y	–	
	Confidentiality held for*	P, R, O	P, R	R	–	–	P, R, O	–	P, R	P, R	U	R	
	Technical infrastructure†	1	2	1	2	–	1 and 2	1 and 2	2	2	U	2	
Data collection	What is reported?‡	I&E	CI	ME	I&E	I&E	I&E	–	MedE	AE	ME	AE	
	Reporters§	HP, F	HP	HP	HP	HP	HP, P, F	–	HP	HP	HP, P, F	HP	
	Reporting format¶	S, E	S, P	S, E	S, P	–	S, E, P	–	S, E	S, E	P	–	
Advanced minimal information model	Patient identification	+	–	+	+	+	+	+	+	+	U	–	
	Incident date and time	+	–	–	+	+	+	+	+	+	U	+	
	Incident location	+	–	+	–	+	+	+	+	+	U	+	
	Causes of incident	+	–	+	+	–	+	–	+	+	–	–	
	Contributing factors	+	+	–	+	+	+	–	+	+	–	–	
	Mitigating factors	+	+	–	+	–	+	–	–	–	–	–	
	Incident type	+	+	+	–	+	+	+	+	+	–	+	
	Incident outcome	+	–	–	+	+	+	–	+	+	–	–	
	Resulting actions	–	+	+	–	+	+	–	+	–	–	+	
	Reporter's role	+	+	+	–	+	+	+	+	–	–	+	
	Severity of harm	+	–	–	+	+	+	+	+	–	–	–	
	Free text part	–	+	+	–	–	+	–	+	–	–	+	
Implementation		–	+	+	–	+	–	–	+	+	–	–	
Data analysis	Approach to classification**	1, 3	1–3	1	–	1	1	1	1–3	1–3	–	–	
	Approach to analysis††	1–4	1	1, 5	2	1, 2	2, 3, 6	2, 4	1, 2	4, 6	–	–	
	Systematic recommendations	Y	N	Y	N	N	Y	Y	Y	Y	–	N	
	Expert evaluation	Y	N	N	N	N	Y	N	Y	Y	–	N	
	Prompt analysis	N	N	N	N	N	Y	Y	U	U	–	N	
Feedback	Feedback to reporters	Y	Y	N	N	N	Y	N	Y	Y	N	N	
	Issue recommendations	U	N	N	N	N	U	N	Y	U	U	U	
Percentage of compliance		79%	53%	58%	34%	39%	87%	34%	74%	66%	16%	26%	

+: included, –: not included, Y: yes, N: no, U: unclear.

\*Patient (P), reporter (R), organisation (O).

†1: relational database, 2: human receiver.

‡I&amp;E: incidents and errors, CI: critical incident, ME: medication error, MedE: medical error, AE: adverse event.

§Healthcare professionals (HP), patients (P), families (F).

¶Structured form (S), open questions (O), electronic (E), paper (P).

\*\*Approach to classification: 1: event type (eg, wrong drug), 2: risk (severity or probability), 3: causation (by contributing factor).

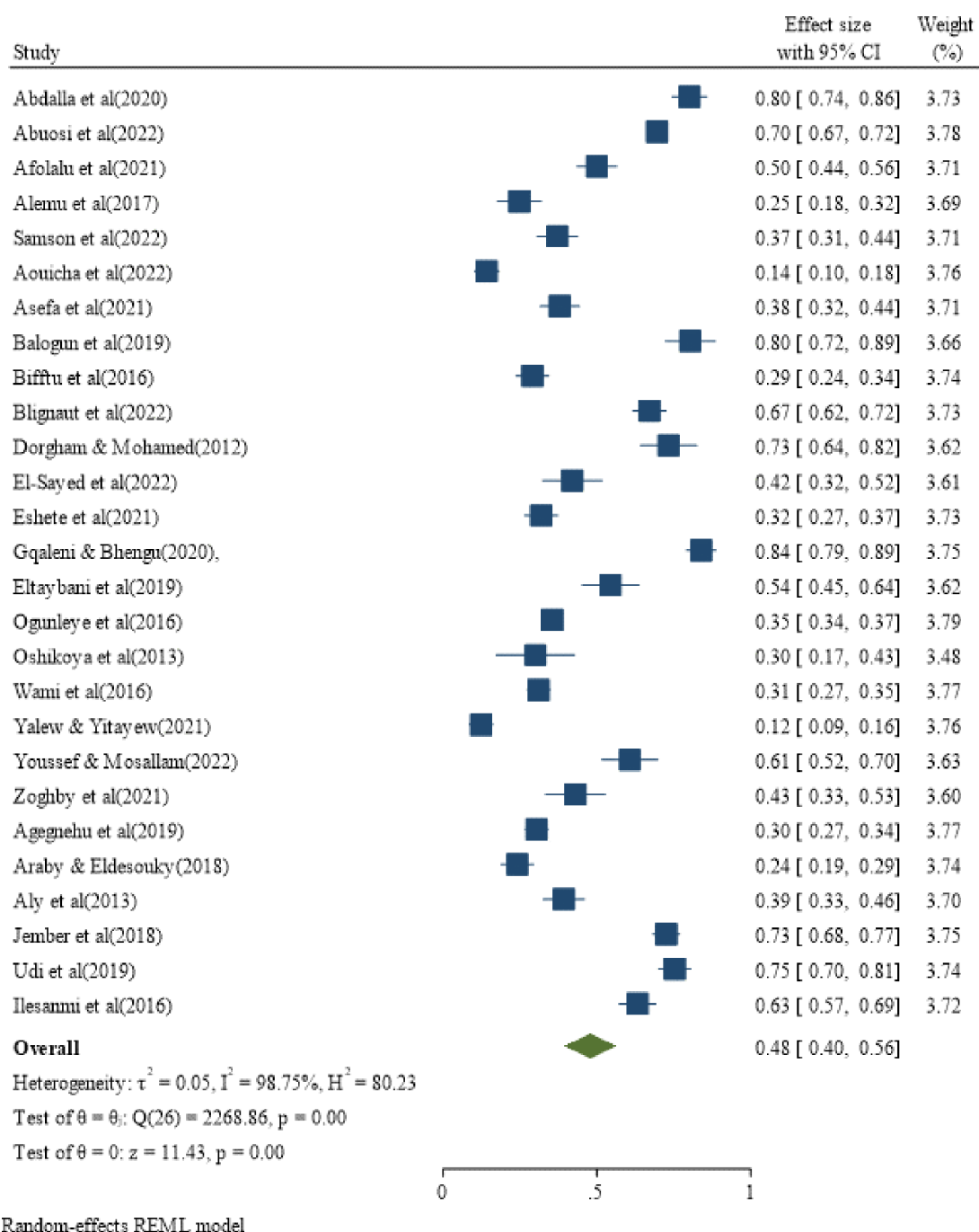
††Approach to analysis: 1: summaries and descriptions, 2: causal analysis, 3: systems analysis, 4: risk analysis, 5: trend and cluster analysis, 6: hazard identification.

E-HSTG, Ethiopian Hospital Services Transformation Guidelines; E-NOMERS, Egyptian National Online Medication Error Reporting Systems; E-NSTN, Egyptian Neonatal Safety Training Network; MSF-MERS, Médecins Sans Frontières Medical Error Reporting Systems; SA-PSIRLS, South African Patient Safety Incident Reporting and Learning Systems; T-AERS, Tunisian Adverse Event Reporting Systems; Z-CIRS, Zimbabwe Critical Incident Reporting Systems; Z-MERS, Zambian Medication Error Reporting Systems.

## Handling heterogeneity

In the random-effects model, the pooled estimate revealed considerable heterogeneity ( $I^2=98.75\%$ ,  $p<0.001$ ). To identify the source of this heterogeneity, a funnel plot, small study effect (Egger's test) and subgroup analysis using study-level variables (study design and country) were performed. However, no definitive source of heterogeneity was identified. This observation is common in meta-analyses of point prevalence studies, where variations may stem from unmeasured factors or may be inherent to the nature of the included studies. Our analysis found no evidence of publication bias or small-study

effects, as indicated by a symmetrical funnel plot and non-significant Egger's test ( $p=0.6603$ ) (figure 4). Additionally, sensitivity analysis (leave-one-out method) showed that no individual study significantly influenced the overall pooled estimates of patient safety incident reporting. When one study was eliminated at a time, the pooled patient safety incident reporting estimate from the remaining articles varied between 47% and 49%, which is consistent with the overall pooled prevalence of 48% (95% CI 40% to 56%) as shown in online supplemental file 4). This consistency underscores the reliability of the findings.



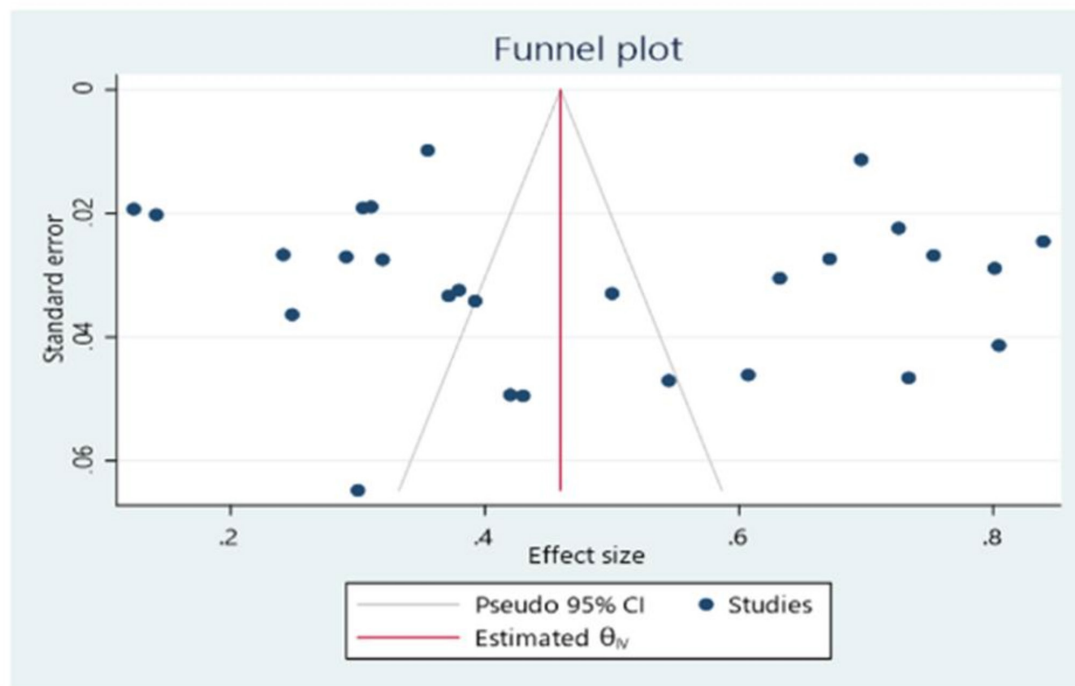
**Figure 3** Forest plot showing the pooled prevalence of patient safety incident reporting practices in African healthcare organisations.

## DISCUSSION

The aim of this systematic review and meta-analysis was to synthesise the available evidence on patient safety incident reporting and learning systems and estimate reporting rates in African healthcare organisations. This review, the first of its kind in Africa, emphasises the importance of aligning incident reporting systems with standardised criteria.<sup>14</sup> Eight reporting systems with low to high levels of adherence to WHO criteria were identified. This finding aligns with the previous review, which found that none of the identified systems have fully complied with WHO criteria.<sup>23</sup> A recent report indicated that only

36% of WHO member states have established sentinel event reporting systems,<sup>46</sup> reflecting insufficient global coverage with most reporting systems being concentrated in HICs.<sup>16–20</sup> In Africa, among the identified reporting systems, SA\_PSIRLS showed a higher level of compliance with the WHO criteria, potentially serving as a model for other African countries. This success underscores the positive impact of consistent policy updates and the coordinated approach to guideline development. In contrast, the remaining reporting systems exhibited only low-to-moderate compliance levels. These may be attributed to limited funding and low awareness, which can contribute





Egger's test:  $H_0: \beta_{\text{eta1}} = 0$ ; no small-study effects,  $\beta_{\text{eta1}} = 1.50$ ,  $SE \text{ of } \beta_{\text{eta1}} = 3.407$ ,  $z = 0.44$ ,  
 $Prob > |z| = 0.6603$

**Figure 4** Funnel plot displaying the symmetrical distribution of articles indicating the absence of publication bias.

to disparities in patient safety outcomes.<sup>47 48</sup> Therefore, addressing these challenges requires adequate financial investment, and the adoption of context-sensitive reporting systems.

The patient safety incident reporting and learning systems included in this review mainly focused on data entry and collection, often overlooking critical elements such as implementation strategies and limiting the ability of healthcare organisations to effectively adopt and use the systems.<sup>49</sup> Using evidence-based frameworks such as RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) may enhance seamless implementation and address contextual factors, facilitate stakeholder engagement, and enhance the reproducibility of the systems.<sup>50–52</sup> In addition, long-term sustainability can be ensured through continuous monitoring and cost-effective evaluations to track the progress and identify areas of improvement.<sup>53</sup> Practical measures such as establishing dedicated local, national and regional oversight bodies and integrating the reporting systems into routine healthcare practices can further strengthen these systems.<sup>54 55</sup> These are vital for achieving the global goal of eliminating preventable patient harm by 2030.<sup>56</sup> Furthermore, it is essential to go beyond mere reporting by establishing teams of experts to review and analyse reports, identify patterns and recommend interventions to enhance learning from incidents.<sup>49</sup> Health policymakers across Africa should develop national policies and guidelines according to WHO criteria, that are contextually appropriate and sensitive to resource constraints on

the continent.<sup>14 57</sup> These may need strong collaboration among policymakers, healthcare leaders, frontline staff, patients and their families, and potentially international partners.<sup>58–60</sup>

Our review found that the pooled prevalence of patient safety incident reporting practices among healthcare professionals in Africa was 48% (95% CI 40% to 56%), with substantial heterogeneity across studies. This variation reflects the diverse landscape of patient safety incident reporting practices across the continent, influenced by differences in healthcare infrastructure, types of patient safety incidents and the characteristics of study participants. Higher heterogeneity is expected in a meta-analysis of prevalence data, especially when studies differ in sample size, location and period.<sup>61 62</sup> Our findings are consistent with a previous review from Iran, which reported a patient safety incident reporting rate of 47.3%,<sup>24</sup> and a review focused on the Asian continent and North America, indicating a reporting rate of 48%.<sup>25</sup> This suggests that challenges in reporting patient safety incidents may be widespread. The low reporting rates observed in African healthcare organisations may be linked to the region's underdeveloped patient safety culture, which ranges from 12.4% to 44.8%.<sup>63</sup> These may discourage healthcare professionals from reporting incidents because of fear of blame, lack of trust in the system or perceived inefficacy of reporting.<sup>64 65</sup> To address these barriers, it is essential to implement user-friendly reporting systems (eg, mobile apps or online platforms), provide training for healthcare professionals to raise

awareness of the importance and methods of reporting, foster a non-punitive reporting culture and promote the adoption of anonymous reporting systems.<sup>66 67</sup> Additionally, leadership commitments such as recognising staff for reporting incidents and providing timely feedback would increase the reporting rates.<sup>5</sup>

Patient and family engagement in patient safety incident reporting is essential in fostering transparency, ensuring patient safety and sharing responsibility in healthcare delivery.<sup>59 60 68</sup> However, only three of the eight identified reporting systems permitted patients and families to report incidents, indicating a significant gap in their engagement.<sup>69</sup> This concern is particularly pressing in Africa, where lower health literacy among the general population is common.<sup>70 71</sup> Therefore, healthcare systems should empower patients and families through tailored awareness creation campaigns and by establishing accessible, culturally appropriate, multi-lingual and user-friendly reporting systems.<sup>72</sup> Furthermore, implementing patient advice and liaison services (PALS), which can assist patients in navigating healthcare systems, addressing complaints and enhancing communication between patients and healthcare professionals, is essential.<sup>73 74</sup> Incorporating patient and family representatives into PALS and other patient safety initiatives can encourage their active involvement and ensure that their perspectives are considered in decision-making. These strategies may foster a supportive and inclusive environment, ultimately enhancing both patient safety and healthcare quality.<sup>75</sup>

Overall, enhancing patient safety incident reporting systems in African healthcare settings requires a multifaceted approach tailored to the region-specific challenges. Addressing gaps such as lower compliance levels of reporting systems with standard criteria and low reporting rates among healthcare professionals is essential for building resilient systems.<sup>76 77</sup> Patient safety incident reporting rates can be increased through regular training of healthcare professionals, strong leadership commitment and recognition of staff who report incidents. Furthermore, clear policies that guide the reporting process along with a multidisciplinary team of experts to review and act on incidents are necessary to promote accountability. Additionally, using evidence-based implementation frameworks and a user-friendly approach can enhance seamless reporting and accessibility of the system, whereas offering anonymous reporting options can reduce the pervasive fear of blame. However, where digital platforms are not feasible, maintaining paper-based systems can be an essential alternative. Integrating the patient safety incident reporting and learning systems into routine clinical practice and quality improvement measures is vital for sustainability. Moreover, continuous monitoring and evaluation and establishing key performance indicators to track reporting trends and outcomes will help to measure the successes. Additionally, tailoring global best practices to local contexts, promoting regional collaborations for knowledge sharing

and addressing sociocultural barriers through awareness creation campaigns and empowerment initiatives such as the establishment of PALS are essential for enhancing reporting practices. This comprehensive approach may assist African healthcare systems to increase reporting rates, promote a culture of learning and move towards the goal of eliminating preventable patient harm by 2030.

### Strengths and limitations

This systematic review and meta-analysis have several strengths, including a comprehensive search strategy, rigorous quality assessment, the inclusion of patient safety incident reporting and learning systems-related guidelines, and the use of meta-analysis to generate a pooled estimate of incident reporting rates. These strengths enhance the reliability and robustness of our findings. However, there are also limitations to consider. The heterogeneity among the included articles may limit the generalisability of the results. Despite the predominance of medical and public health research publications in English in Africa, the exclusion of non-English articles may have narrowed the scope of the review, potentially omitting relevant evidence. The word count limitations and restrictions imposed by journals may have constrained the inclusion of detailed information about incident reporting systems, potentially resulting in the omission of certain criteria.

### Recommendations for future research

Future research should focus on understanding the key components of incident reporting, such as data analysis, implementation, feedback mechanisms, analysis and corrective measures. Longitudinal studies will be essential for evaluating the impact and sustainability of these systems, using evidence-based implementation frameworks. In addition, exploring ways to enhance patient and family engagement in patient safety incident reporting will offer valuable insights for improving patient safety and healthcare quality in Africa and other low- and middle-income countries. In addition, we recommend that future reviews on this subject should consider publications in non-English and indigenous African languages for a comprehensive exploration of the patient safety incident reporting systems and practices in Africa.

### CONCLUSION

Effective patient safety incident reporting and learning systems are essential for enhancing patient safety and healthcare quality. This review emphasises the need to align system adoption and implementation with WHO criteria. Additionally, there is an urgent need for standardised guidelines for patient safety incident reporting systems in Africa that consider local contexts. Policymakers, healthcare leaders and researchers must prioritise the development and refinement of the systems to foster safety culture, encourage reporting and facilitate learning from incidents. In addition, the utilisation of evidence-based implementation frameworks such as

RE-AIM enhances the seamless implementation and sustainability of the system. Frontline healthcare professionals, patients and families play a vital role in advocating for and reporting patient safety incidents. Therefore, empowering them through education and training can significantly enhance the system's effectiveness. Improving patient safety goes beyond implementing reporting systems; it requires addressing systemic issues, overcoming cultural barriers and adapting solutions to the specific challenges and resource constraints of African healthcare organisations.

#### Author affiliations

<sup>1</sup>School of Nursing and Midwifery, Griffith University, Gold Coast Campus, 1 Parklands Dr, Southport, Queensland, Australia 4222

<sup>2</sup>School of Nursing, College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia 235

<sup>3</sup>Department of Emergency Medicine, Gold Coast Hospital and Health Service, 1 Hospital Blvd, Southport, Queensland, Australia 4215

<sup>4</sup>Florence Nightingale Faculty of Nursing, Midwifery and Palliative Care, Kings College, London, UK

<sup>5</sup>National Health and Medical Research Council, Centre of Research Excellence in Wiser Wound Care, Griffith University, Gold Coast Campus, 1 Parklands Dr, Southport, Queensland, Australia 4222

<sup>6</sup>Nursing and Midwifery Education and Research Unit, Gold Coast University Hospital and Health Service, 1 Hospital Blvd, Southport, Queensland, Australia 4215

<sup>7</sup>School of Psychology and Wellbeing, University of Southern Queensland - Ipswich Campus, Ipswich, Queensland, Australia

<sup>8</sup>Public Health, School of Medicine and Dentistry, Griffith University, Gold Coast Campus, 1 Parklands Dr, Southport, Queensland, Australia 4222

<sup>9</sup>Department of Public Health (Human Nutrition), College of Health Sciences, Debre Tabor University, Debre Tabor, Ethiopia 6300

**Contributors** GF: conceptualisation; data curation; formal analysis; investigation; methodology; software; visualisation; writing-original draft preparation; writing-review and editing. GF, as guarantor, accepts full responsibility for the work and/or conduct of the study. RM: conceptualisation; data curation; formal analysis; investigation; methodology; software; supervision; validation; visualisation; writing-review and editing. GT: conceptualisation; data curation; formal analysis; investigation; methodology; software; supervision; validation; visualisation; writing-review and editing. MJJ: data curation; formal analysis; investigation; methodology; software; supervision; validation; visualisation; writing-review and editing. MTE: data curation; formal analysis, visualisation, writing-review and editing. APM: conceptualisation; data curation; formal analysis; investigation; methodology; software; supervision; validation; visualisation; writing-review and editing.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All data relevant to the study are included in the article or uploaded as supplementary information. Not Applicable.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iDs

Gelana Fekadu <http://orcid.org/0000-0001-5409-4979>

Rachel Muir <http://orcid.org/0000-0003-3345-9929>

Georgia Tobiano <http://orcid.org/0000-0001-5437-0777>

Michael J Ireland <http://orcid.org/0000-0001-6064-3575>

Melaku Tadege Engidaw <http://orcid.org/0000-0002-1970-5102>

Andrea P Marshall <http://orcid.org/0000-0001-7692-403X>

#### REFERENCES

- Cooper J, Williams H, Hibbert P, *et al*. Classification of patient-safety incidents in primary care. *Bull World Health Organ* 2018;96:498–505.
- WHO. Conceptual framework for the international classification for patient safety. 2009. Available: [http://www.who.int/patientsafety/taxonomy/ICPS\\_Statement\\_of\\_Purpose.pdf](http://www.who.int/patientsafety/taxonomy/ICPS_Statement_of_Purpose.pdf)
- Slawomirski L, Klazinga N. The economics of patient safety: From analysis to action. *Oxf Prof Pract Handb Patient Saf* 2020;43–54.
- Panagioti M, Khan K, Keers RN, *et al*. Prevalence, severity, and nature of preventable patient harm across medical care settings: systematic review and meta-analysis. *BMJ* 2019;366.
- Stavropoulou C, Doherty C, Tosey P. How Effective Are Incident-Reporting Systems for Improving Patient Safety? A Systematic Literature Review. *Milbank Q* 2015;93:826–66.
- Ferorelli D, Solarino B, Trotta S, *et al*. Incident Reporting System in an Italian University Hospital: A New Tool for Improving Patient Safety. *Int J Environ Res Public Health* 2020;17:6267.
- Ramírez E, Martín A, Villán Y, *et al*. Effectiveness and limitations of an incident-reporting system analyzed by local clinical safety leaders in a tertiary hospital: Prospective evaluation through real-time observations of patient safety incidents. *Medicine (Baltimore)* 2018;97:e12509.
- Serou N, Sahota LM, Husband AK, *et al*. Learning from safety incidents in high-reliability organizations: a systematic review of learning tools that could be adapted and used in healthcare. *Int J Qual Health Care* 2021;33:1–9.
- Busse R, Panteli D, Quentin W. An introduction to healthcare quality: defining and explaining its role in health systems - Improving healthcare quality in Europe. *Eur Obs Health Syst Policies* 2019;1–11.
- Mitchell PH. Defining patient safety and quality care. In: *Patient safety and quality: an evidence-based handbook for nurses*. 2008.
- Carlford S, Öhrn A, Gunnarsson A. Experiences from ten years of incident reporting in health care: a qualitative study among department managers and coordinators. *BMC Health Serv Res* 2018;18:113.
- Reason J. Human error: models and management. *BMJ* 2000;320:768–70.
- Kakemam E, Gharaee H, Rajabi MR, *et al*. Nurses' perception of patient safety culture and its relationship with adverse events: a national questionnaire survey in Iran. *BMC Nurs* 2021;20:60.
- WHO. Draft guidelines for adverse event reporting and learning systems - from information to action. Geneva Switz; 2005. Available: <https://iris.who.int/handle/10665/69797>
- WHO. Minimal information model for patient safety incident reporting and learning systems. 2016. Available: <https://apps.who.int/iris/bitstream/handle/10665/255642/WHO-HIS-SDS-2016.22eng.pdf?sequence=>
- Canadian Institute for Health Information. National system for incident reporting (NSIR). CIHI; 2018. Available: <https://www.cihi.ca/en/introduction-to-the-national-system-for-incident-reporting-nsir>
- Danish Patient Safety Authority. Danish patient safety authority. 2022. Available: <https://en.stps.dk/en/> [https://stps.dk/sitecore/Content/danish-patient-safety-authority/about-us/organisation?sc\\_lang=en%0Ahttps://stps.dk/en](https://stps.dk/sitecore/Content/danish-patient-safety-authority/about-us/organisation?sc_lang=en%0Ahttps://stps.dk/en)
- Milch CE, Salem DN, Pauker SG, *et al*. Voluntary electronic reporting of medical errors and adverse events. An analysis of 92,547 reports from 26 acute care hospitals. *J Gen Intern Med* 2006;21:165–70.
- Runciman WB. Lessons from the Australian Patient Safety Foundation: setting up a national patient safety surveillance system—is this the right model? *Qual Saf Health Care* 2002;11:246–51.



- 20 Williams SK, Osborn SS. The development of the National Reporting and Learning System in England and Wales, 2001-2005. *Med J Aust* 2006;184:S65-8.
- 21 van Zyl C, Badenhorst M, Hanekom S, *et al.* Unravelling 'low-resource settings': a systematic scoping review with qualitative content analysis. *BMJ Glob Health* 2021;6:e005190:1-14.
- 22 Elmontsri M, Banarsee R, Majeed A. Improving patient safety in developing countries - moving towards an integrated approach. *JRSM Open* 2018;9.
- 23 Brunsvelde-Reinders AH, Arbous MS, De Vos R, *et al.* Incident and error reporting systems in intensive care: a systematic review of the literature. *Int J Qual Health Care* 2016;28:2-13.
- 24 Azami-Aghdash S, Ebadifard Azar F, Rezapour A, *et al.* Patient safety culture in hospitals of Iran: a systematic review and meta-analysis. *Med J Islam Repub Iran* 2015;29:251:724-36.
- 25 Okuyama JHH, Galvao TF, Silva MT. Healthcare Professional's Perception of Patient Safety Measured by the Hospital Survey on Patient Safety Culture: A Systematic Review and Meta-Analysis. *Sci World J* 2018;2018:9156301.
- 26 Munn Z, Moola S, Lisy K, *et al.* Methodological guidance for systematic reviews of observational epidemiological studies reporting prevalence and cumulative incidence data. *Int J Evid Based Healthc* 2015;13:147-53.
- 27 Borges Migliavaca C, Stein C, Colpani V, *et al.* How are systematic reviews of prevalence conducted? A methodological study. *BMC Med Res Methodol* 2020;20:96.
- 28 Muka T, Glisic M, Milic J, *et al.* A 24-step guide on how to design, conduct, and successfully publish a systematic review and meta-analysis in medical research. *Eur J Epidemiol* 2020;35:49-60.
- 29 Tawfik GM, Dila KAS, Mohamed MYF, *et al.* A step by step guide for conducting a systematic review and meta-analysis with simulation data. *Trop Med Health* 2019;47:46.
- 30 Page MJ, McKenzie JE, Bossuyt PM, *et al.* The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Syst Rev* 2021;10:89.
- 31 Briggs J, Joanna Briggs Inst. Checklist for systematic reviews and research syntheses. 2017.
- 32 Harrison R, Jones B, Gardner P, *et al.* Quality assessment with diverse studies (QuADS): an appraisal tool for methodological and reporting quality in systematic reviews of mixed- or multi-method studies. *BMC Health Serv Res* 2021;21:144.
- 33 Madzimbamuto FD, Chiware R. A critical incident reporting system in anaesthesia. *Cent Afr J Med* 2001;47:243-7.
- 34 ELMeneza S, AbuShady M. Anonymous reporting of medical errors from The Egyptian Neonatal Safety Training Network. *Pediatr Neonatol* 2020;61:31-5.
- 35 Holmström A-R, Airaksinen M, Weiss M, *et al.* National and local medication error reporting systems: a survey of practices in 16 countries. *J Patient Saf* 2012;8:165-76.
- 36 Shanks L, Bil K, Fernhout J. Learning without Borders: A Review of the Implementation of Medical Error Reporting in Médecins Sans Frontières. *PLoS One* 2015;10.
- 37 Shehata ZHA, Sabri NA, Elmelegy AA. Descriptive analysis of medication errors reported to the Egyptian national online reporting system during six months. *J Am Med Inform Assoc* 2016;23:366-74.
- 38 Singh S, Mahomed O. Nature and type of patient-reported safety incidents at a tertiary hospital in South Africa during the COVID-19 period (2018-2021)- A retrospective review. *PLoS One* 2023;18.
- 39 Tilili MA, Aouicha W, Gambashidze N, *et al.* A retrospective analysis of adverse events reported by Tunisian intensive care units' professionals. *BMC Health Serv Res* 2024;24:77.
- 40 Mgobozi P, Mahomed OH. Epidemiology of patient safety incidents in a long-term rehabilitative hospital in KwaZulu-Natal, South Africa (April 2011 to March 2016). *Curationis* 2011;44:e1-6.
- 41 Department of Health. National guideline for patient safety incident reporting and learning in the health sector of South Africa. 2022.1-69.
- 42 Ethiopian Ministry of Health. Ethiopian hospital services transformation guidelines. 2016. Available: <http://repository.iphce.org/handle/123456789/220>
- 43 Mahomed O. Adverse events monitoring and reporting. 2007. Available: <https://www.kznhealth.gov.za/family/Adverse-events-monitoring-reporting-guidelines.pdf>
- 44 Gqaleni TM, Bhengu BR. Analysis of Patient Safety Incident reporting system as an indicator of quality nursing in critical care units in KwaZulu-Natal, South Africa. *Health SA* 2020;25:1263.
- 45 Brotozor D, Brotozor O, Okomayin A, *et al.* Assessment of Barriers to Voluntary Reporting Of Medication Errors. *J Nurs Health Sci IOSR-JNHS* 2021;10:25-8.
- 46 WHO teams. Implementation of the global patient safety interim report based on the first survey of patient safety in who member states. 2023.
- 47 Oleribe OO, Momoh J, Uzochukwu BS, *et al.* Identifying Key Challenges Facing Healthcare Systems In Africa And Potential Solutions. *Int J Gen Med* 2019;12:395-403.
- 48 Azevedo MJ. The State of Health System(s) in Africa: Challenges and Opportunities. *Hist Perspect State Health Health Syst Afr* 2017;11:1-73.
- 49 Mitchell I, Schuster A, Smith K, *et al.* Patient safety incident reporting: a qualitative study of thoughts and perceptions of experts 15 years after 'To Err is Human'. *BMJ Qual Saf* 2016;25:92-9.
- 50 Kilbourne AM, Glasgow RE, Chambers DA. What Can Implementation Science Do for You? Key Success Stories from the Field. *J Gen Intern Med* 2020;35:783-7.
- 51 King DK, Shoup JA, Raebel MA, *et al.* Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study. *Front Public Health* 2020;8:59.
- 52 Moullin JC, Dickson KS, Stadnick NA, *et al.* Ten recommendations for using implementation frameworks in research and practice. *Implement Sci Commun* 2020;1:42.
- 53 Rey E, Laprise M, Lufkin S. Sustainability monitoring: principles, challenges, and approaches. In: Rey E, Laprise M, Lufkin S, eds. *Neighbourhoods in Transition: Brownfield Regeneration in European Metropolitan Areas*. Springer International Publishing, Cham, 2022: 121-42.
- 54 Haillemariam M, Bustos T, Montgomery B, *et al.* Evidence-based intervention sustainability strategies: a systematic review. *Implement Sci* 2019;14:57.
- 55 Iwelunmor J, Blackstone S, Veira D, *et al.* Toward the sustainability of health interventions implemented in sub-Saharan Africa: a systematic review and conceptual framework. *Implement Sci* 2016;11:43.
- 56 WHO. Global patient safety action plan 2021-2030:towards eliminating avoidable harm e health care. World Health Organization; 2021.
- 57 Howell AM, Burns EM, Hull L, *et al.* International recommendations for national patient safety incident reporting systems: an expert Delphi consensus-building process. *BMJ Qual Saf* 2017;26:150-63.
- 58 Morris RL, Ruddock A, Gallacher K, *et al.* Developing a patient safety guide for primary care: A co-design approach involving patients, carers and clinicians. *Health Expect* 2021;24:42-52.
- 59 Dijkstra BM, Felten-Barentsz KM, van der Valk MJM, *et al.* Exploring patients' and relatives' needs and perceptions regarding family participation in essential care in the intensive care unit: A qualitative study. *Intensive and Critical Care Nursing* 2023;79:103525.
- 60 Ocloo J, Garfield S, Franklin BD, *et al.* Exploring the theory, barriers and enablers for patient and public involvement across health, social care and patient safety: a systematic review of reviews. *Health Res Policy Syst* 2021;19:8:8.
- 61 Barker TH, Migliavaca CB, Stein C, *et al.* Conducting proportional meta-analysis in different types of systematic reviews: a guide for synthesisers of evidence. *BMC Med Res Methodol* 2021;21:189.
- 62 Migliavaca CB, Stein C, Colpani V, *et al.* Meta-analysis of prevalence: I<sup>2</sup> statistic and how to deal with heterogeneity. *Res Synth Methods* 2022;13:363-7.
- 63 Konlan KD, Shin J. The status and the factors that influence patient safety in health care institutions in Africa: A systematic review. *PLoS Glob Public Health* 2022;2:e0001085.
- 64 Kaya S, Banaz Goncuoglu M, Mete B, *et al.* Patient Safety Culture: Effects on Errors, Incident Reporting, and Patient Safety Grade. *J Patient Saf* 2023;19:439-46.
- 65 Wawersik DM, Boutin ER, Gore T, *et al.* Individual Characteristics That Promote or Prevent Psychological Safety and Error Reporting in Healthcare: A Systematic Review. *J Healthc Leadersh* 2023;15:59-70.
- 66 Yesilyaprak T, Demir Korkmaz F. The relationship between surgical intensive care unit nurses' patient safety culture and adverse events. *Nurs Crit Care* 2023;28:63-71.
- 67 Alalaween MA, Karia N. The predictive power of electronic reporting system utilization on voluntary reporting of near-miss incidents among nurses: A PLS-SEM approach. *Belitung Nurs J* 2024;10:15-22.
- 68 O'Hara JK, Canfield C. The future of engaging patients and families for patient safety. *The Lancet* 2024;403:791-3.
- 69 Illingworth J, Shaw A, *et al.* Global state of patient safety 2023. 2023. Available: <https://www.google.com/search?client=firefox-b-d&q=Global+State+of+Patient+Safety>
- 70 Amanu A A, Birhanu Z, Godesso A. . *RMHP* 2023;Volume 16:425-37. 10.2147/RMHP.S399196

- 71 Marimwe C, Dowse R. Health literacy test for limited literacy populations (HELT-LL): Validation in South Africa. *Cogent Med* 2019;6:1650417.
- 72 Sahlström M, Partanen P, Turunen H. Patient-reported experiences of patient safety incidents need to be utilized more systematically in promoting safe care. *Int J Qual Health Care* 2018;30:778–85.
- 73 Shepard K, Buivydaitė R, Vincent C. How do National Health Service (NHS) organisations respond to patient concerns? A qualitative interview study of the Patient Advice and Liaison Service (PALS). *BMJ Open* 2021;11:e053239.
- 74 Abbott S, Meyer J, Bentley J, et al. Patient Advice and Liaison Services: strengthening the voices of individual service users in health-care organizations. *Health Expect* 2006;9:138–47.
- 75 Cartwright E. Patient advice and liaison service. In: *An introduction to clinical governance and patient safety*. Oxford University Press, 2011.
- 76 Albreiki S, Simsekler MCE, Qazi A, et al. Assessment of the organizational factors in incident management practices in healthcare: A tree augmented Naive Bayes model. *PLoS One* 2024;19:e0299485.
- 77 Herzer KR, Mirrer M, Xie Y, et al. Patient safety reporting systems: sustained quality improvement using a multidisciplinary team and 'good catch' awards. *Jt Comm J Qual Patient Saf* 2012;38:339–47.
- 78 Abdalla EA, Abdoon IH, Osman B, et al. Perception of medication errors' causes and reporting among Sudanese nurses in teaching hospitals. *Appl Nurs Res* 2020;51.
- 79 Abuosi AA, Poku CA, Attafuah PYA, et al. Safety culture and adverse event reporting in Ghanaian healthcare facilities: Implications for patient safety. *PLoS One* 2022;17:e0275606.
- 80 Afolalu OO, Jordan S, Kyriacos U. Medical error reporting among doctors and nurses in a Nigerian hospital: A cross-sectional survey. *J Nurs Manag* 2021;29:1007–15.
- 81 Alemu W, Belachew T, Yimam I. Medication administration errors and contributing factors: A cross sectional study in two public hospitals in Southern Ethiopia. *IJANS* 2017;7:68–74.
- 82 Alhassan S, Kwashie AA, Paarima Y, et al. Assessing managerial patient safety practices that influence adverse events reporting among nurses in the Savannah Region, Ghana. *J Patient Saf Risk Manag* 2022;27:218–28.
- 83 Aouicha W, Tlili MA, Sahli J, et al. Patient safety culture as perceived by operating room professionals: a mixed-methods study. *BMC Health Serv Res* 2022;22:799.
- 84 Asefa KK, Dagne D, Mekonnen WN. Medication Administration Error Reporting and Associated Factors among Nurses Working in Public Hospitals, Ethiopia: A Cross-Sectional Study. *Nurs Res Pract* 2021;2021:1384168.
- 85 Balogun JA, Adekanmbi A, Balogun FM. Recognition and Disclosure of Medical Errors Among Residents in Surgical Specialties in a Tertiary Hospital in Ibadan. *World J Surg* 2019;43:717–22.
- 86 Biftu BB, Dachew BA, Tiruneh BT, et al. Medication administration error reporting and associated factors among nurses working at the University of Gondar referral hospital, Northwest Ethiopia, 2015. *BMC Nurs* 2016;15:43.
- 87 Blignaut AJ, Coetzee SK, Klopper HC, et al. Nurses' perceptions of medication administration safety in public hospitals in the Gauteng Province: A mixed method study. *IJANS* 2022;17:100504.
- 88 Ragab Dorgham S, Khamis Mohamed L. Personal Preference and Perceived Barriers toward Disclosure and Report of Incident Errors among Healthcare Personnel Perceived Nursing Students' Satisfaction and Self-Confidence towards the Elements of Clinical Simulation Design and Educational Practice. *Life Sci J* 2012;9:1097–8135.
- 89 El-Sayed Aly RI, Ahmed Mohamed ELBahawan G, Aly MR, et al. Enhancing the Occurrence Variance Reporting System Implementation at one of the Hospitals of the Egyptian Universal Health Insurance. *SAGE Open Nurs* 2022;8.
- 90 Eshete Y, Tesfaye B, Dagnew Z, et al. Corrigendum to 'Critical Incident Disclosing Behaviors and Associated Factors among Nurses Working in Amhara Region Referral Hospitals, Northwest Ethiopia: A Cross-Sectional Study'. *Crit Care Res Pract* 2021;2021:9842972.
- 91 Eltaybani S, Mohamed N, Abdelwareth M. Nature of nursing errors and their contributing factors in intensive care units. *Nurs Crit Care* 2019;24:47–54.
- 92 Ogunleye OO, Oreagba IA, Falade C, et al. Medication errors among health professionals in Nigeria: A national survey. *Int J Risk Saf Med* 2016;28:77–91.
- 93 Oshikoya KA, Oreagba IA, Ogunleye OO, et al. Medication administration errors among paediatric nurses in Lagos public hospitals: an opinion survey. *Int J Risk Saf Med* 2013;25:67–78.
- 94 Wami SD, Demssie AF, Wassie MM, et al. Patient safety culture and associated factors: A quantitative and qualitative study of healthcare workers' view in Jimma zone Hospitals, Southwest Ethiopia. *BMC Health Serv Res* 2016;16.
- 95 Yalew ZM, Yitayew YA. Clinical incident reporting behaviors and associated factors among health professionals in Dessie comprehensive specialized hospital, Amhara Region, Ethiopia: a mixed method study. *BMC Health Serv Res* 2021;21.
- 96 Youssef Elshoura SM, Mosallam RA. Knowledge, attitudes and practices of clinical pharmacists to medication error reporting in ministry of health and population hospitals in Egypt. *J Patient Saf Risk Manag* 2022;27:188–96.
- 97 Zoghby MG, Hoffman D, Mahomed Z. The reporting of adverse events in Johannesburg Academic Emergency Departments. *Afr J Emerg Med* 2021;11:207–10.
- 98 Agegnehu W, Alemu A, Ololo S, et al. Incident reporting behaviors and associated factors among health care professionals working in public hospitals in Addis Ababa, Ethiopia 2017. *MOJPH* 2019;8:182–7.
- 99 Eldesouky R, Araby E, Abed H. Medical Errors Among Nurses in The University Hospital of Benha, Egypt: Forms, Underlying Factors and Reporting. *BJSTR* 2018;7:1–8.
- 100 Aly E, Hashish A, Galal El-Bialy G. Nurses' Perceptions of Safety Climate and Barriers to Report Medication Errors. Nurses' Perceptions of Safety Climate and Barriers to Report Medication Errors. *Life Sci J* 2013;10:1097–8135.
- 101 Jember A, Hailu M, Messele A, et al. Proportion of medication error reporting and associated factors among nurses: a cross sectional study. *BMC Nurs* 2018;17:9.
- 102 Udi OA, Ogbu BN, Chukwuyem NE, et al. Assessment of nurses' opinion about reporting medication errors: a cross-sectional study. *Research Journal of Health Sciences* 2019;7:256.
- 103 Ilesanmi RE, Okojie EO, Ojerinde AC. Methods of voluntary reporting medication administration errors among nurses in the University College Hospital, Ibadan, Nigeria. *Afr J Med Med Sci* 2016;45:197–206.