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Patient and family engagement interventions for enhancing patient safety in the perioperative journey: a scoping review

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ABSTRACT

Background Surgical procedures present intricate challenges within healthcare delivery, often associated with higher risks of adverse events compared with non-surgical contexts. Patient and family engagement (PFE) throughout the perioperative journey is a possibility to enhance care quality, safety and patient-centredness. However, literature addressing PFE across the entirety of the perioperative journey remains sparse.

Objective The current scoping review aims to comprehensively map the existing interventions with PFE approach focused on improving patient safety across various types of surgical procedures throughout the perioperative journey. In addition, the review aims to understand the level and type of PFE approach adopted in this context.

Eligibility criteria Articles published in indexed peer-reviewed journals from 2003 to 2023, written in English, Portuguese or Spanish, that report on interventions with PFE approach targeting adult surgical patients, their families, caregivers, patient advocates and patient champions. The review includes articles reporting on both inpatient and ambulatory surgical patients.

Methods Following Joanna Briggs Institute guidelines and the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews framework, this review systematically searched PubMed, Web of Science, SCOPUS, CINAHL, and PsycINFO for relevant articles. Eligible interventions were categorised using PFE framework regarding the level of engagement and mapped according to the WHO Global Patient Safety Action Plan 2021–2030.

Results Out of 765 records initially identified, 32 met the eligibility criteria for data extraction and analysis, of which 40% originated from the USA, followed by the UK (18%) and Canada (12%). 47% of the interventions targeted 'multiple/all types' of procedures, 19% focused on cardiothoracic surgeries and 9% on gynaecological procedures or organ transplant. The majority of the interventions (88%) focused on PFE at the direct care level, predominantly adopting a consultation-based approach. Furthermore, 81% of eligible interventions emphasised patient information and education, 16% addressed codevelopment of policy and 3% of interventions focused on patient advocacy.

Conclusion The findings show a predominant focus on PFE interventions targeting patient safety at the direct care level, particularly in the provision of patient information and education. However, interventions at organisational and policy-making levels are notably scarce. Further investment is required to promote interventions engaging patients and families at broader organisational and policy-making levels.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Prior research has shown that surgical patients are at 2.3 times higher risk of adverse events, highlighting the potential role of patient and family engagement (PFE) approach in improving patient safety and quality in healthcare. Nonetheless, the current body of literature falls short of providing a holistic understanding of PFE across the entire perioperative process, underscoring the necessity for more in-depth exploration.

WHAT THIS STUDY ADDS

⇒ This study provides a comprehensive mapping of the interventions using PFE approach across various periods of the perioperative journey, highlighting their focus areas, geographical distribution and type of surgical procedure. The findings show that most of the interventions adopted consultation type of PFE approach with fewer using involvement or partnership and shared leadership. In addition, the study reveals a predominance of PFE interventions at the direct care level, particularly in patient information and education, while also identifying a scarcity of interventions targeting organisational and policy-making levels.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The study highlights the pressing need for expanded PFE interventions at organisational and policy-making levels, as well as across the entire spectrum of the engagement continuum.

INTRODUCTION

Undergoing a surgical intervention is a risk factor for the patient safety, as evidenced by research.[1 2] A study conducted in Spain across 34 hospitals analysed the prevalence of adverse events and determined that surgical patients have 2.3 times higher risk of suffering

from an adverse event.[1] Moreover, surgical adverse events tend to be more severe accounting for 92% of cases of prolonged hospital stay due to an adverse event.[1] In addition, surgical patients show higher prevalence of comorbidities prior to the surgery which further exacerbates the risk of adverse events intrinsic to the complexity of the surgical procedure.[1] However, research has shown that although the prevalence of adverse events in surgical patients is significantly high so is its preventability.[1–3] In a year, approximately 243 million surgeries are performed worldwide, and medical advances aligned with the technological innovation allow for more surgeries with higher levels of complexity to take place. It is thus paramount to study multilevel interventions aimed at increasing patient safety and quality of care in patients submitted to a surgical procedure.[1–5]

Patient and family engagement (PFE) defined by WHO as 'the facilitation and strengthening of the role of those using services as coproducers of health, and healthcare policy and practice'[6] is an approach which has shown positive results on the patient safety and quality in healthcare.[7 8] PFE contributes to provision of healthcare service more responsive to the patients' needs, increases quality of healthcare, allows for timely detection of errors or omissions, reduces healthcare-associated infections and decreases adverse events.[7] In addition, PFE allows the patients to take ownership and share responsibility for their care process, contributes to a shared decision-making process in health and consequently has positive impact on patient safety.[7 9] The influence of PFE on patient safety comes from the understanding that patients and their family members remain the only constant throughout the entire healthcare journey, offering invaluable insights into healthcare process.[7] The WHO Global Patient Safety Action Plan 2021–2030 highlights the importance of PFE approach by dedicating one of its strategic objectives to PFE (ie, strategic objective 4 (SO4) 'Engage and empower patients and families to help and support the journey to safer healthcare') reflecting a multilevel strategic and operational commitment.[6]

While surgical complexity is recognised as a risk factor for patient safety, the extent to which PFE approach is used in the interventions across the perioperative journey remains inadequately explored. The existing literature has focused on intrahospital infection control,[9] implementation of specific interventions (eg, hand hygiene)[10] or restricted to a specific field of healthcare (eg, nursing).[11] Therefore, the current scoping review aims to comprehensively map the existing interventions with PFE approach focused on improving patient safety across various types of surgical procedures throughout the entire perioperative journey. Furthermore, this review aims to identify the type of PFE approach, and specific activities implemented in the eligible studies.

METHODS

The current scoping review was conducted using the Joanna Briggs Institute[12] updated guidelines for scoping reviews and reported according to Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews[13] (online supplemental material S1). In addition, the review protocol was registered at the Open Science Framework and is available for consultation through the following link: osf.io/hnkj5.

Eligibility criteria

Population

The current review focused on surgical patients, that is, patients who underwent emergency or elective surgical procedures with hospitalisation or in ambulatory care. No restriction was placed on the type of surgical procedures or anatomic location. In addition, the study included interventions targeted at the surgical patient's family members, informal caregivers, patient advocates and patient champions.

Interventions were restricted to adult surgical patients (≥18 years old) and adult family/informal caregivers of any sex, gender, ethnicity who were receiving perioperative care.

Concept

The core concepts of this review are interventions in the field of 'patient safety' which adopt PFE approach. Interventions eligible for the current review are all the actions listed under the SO4 of the WHO Global Patient Safety Action Plan 2021–2030. Current review adopted WHO definition for 'patient safety' that is, 'a framework of organised activities that creates cultures, processes and procedures, behaviours, technologies, and environments in healthcare that consistently and sustainably: lower risks, reduce the occurrence of avoidable harm, make error less likely and reduce its impact when it does occur'.[14] When referring to PFE approach, this review adopts the definition provided by the Carman *et al* which describes PFE as an 'active partnership at various levels across the healthcare system—direct care, organisational design and governance, and policy-making—to improve health and healthcare'.[15]

Context

The context of the intervention included the entire perioperative care, that is, from the moment when patients are contemplating to undergo surgical procedure until hospital discharge, handover to primary healthcare services or rehabilitation services. No restrictions were placed on the type of healthcare provider/setting or country of implementation.

Sources of evidence

Sources of evidence were restricted to the articles published in indexed peer-reviewed journals. Quantitative, qualitative and mixed-method types of studies were included, while study protocols and evidence synthesis (eg, systematic reviews, meta-analysis, literature reviews) were excluded. No grey literature was consulted.

Further information regarding the eligibility criteria can be found in online supplemental material S2.

Search strategy

The search strategy included an initial iterative process of constructing the search query by the first author with the support of a qualified research librarian. In the first stage, a simplified search query was applied in two electronic databases, PubMed and Web of Sciences. The search results were screened by the first author, key terms in the title and abstract of the identified studies were analysed and retrieved. Afterwards, PubMed MeSH thesaurus was consulted to identify broader keywords and an enhanced search query was constructed. The final search query included MeSH thesaurus terms combined with free terms.

The search was conducted on five electronic databases (PubMed, Web of Science, SCOPUS, CINAHL and PsycINFO), the query and filters applied were adjusted according to the requirements of each electronic database. The publications were limited to articles published in English, Portuguese and Spanish languages in the last 20 years (ie, 2003–2023). Complete search query and filters applied for individual databases can be consulted in online supplemental material S3.

Study selection

The identified records in each electronic database were retrieved in the research information system (RIS) file type and uploaded to CADIMA[16 17] (ie, a free online software which assists the entire process of evidence synthesis) which merged the RIS files, identified and removed duplicates on confirmation by the first author. Double deduplication process was undertaken by using systematic review accelerator[18] where the second duplicate detection and removal was performed.

Afterwards, the unique records were screened for 'title' and 'abstract' according to the eligibility criteria previously reported. Full-text screening of the eligible records was conducted with the assistance of Zotero[19] citation manager, where the PDF files containing full text were uploaded. Research librarian and corresponding authors were contacted in efforts to obtain full-text PDF files of articles which were not openly accessible. Double-screening method was adopted for the entire screening process, with four authors independently screening the articles (AMA+ASeyfulayeva, BFF+ASeyfulayeva and AShaikh+ASeyfulayeva). Differences among the authors were addressed through meetings where consensus was reached.

Data extraction and analysis

The data extraction of eligible articles was undertaken using a specifically tailored data charting form in Microsoft Office spreadsheet[20] which was modified throughout the study to address the needs of the data extraction process. The information extracted from the articles included article metadata, population, concept, and context. In addition, all the interventions in the eligible articles were classified using two frameworks:

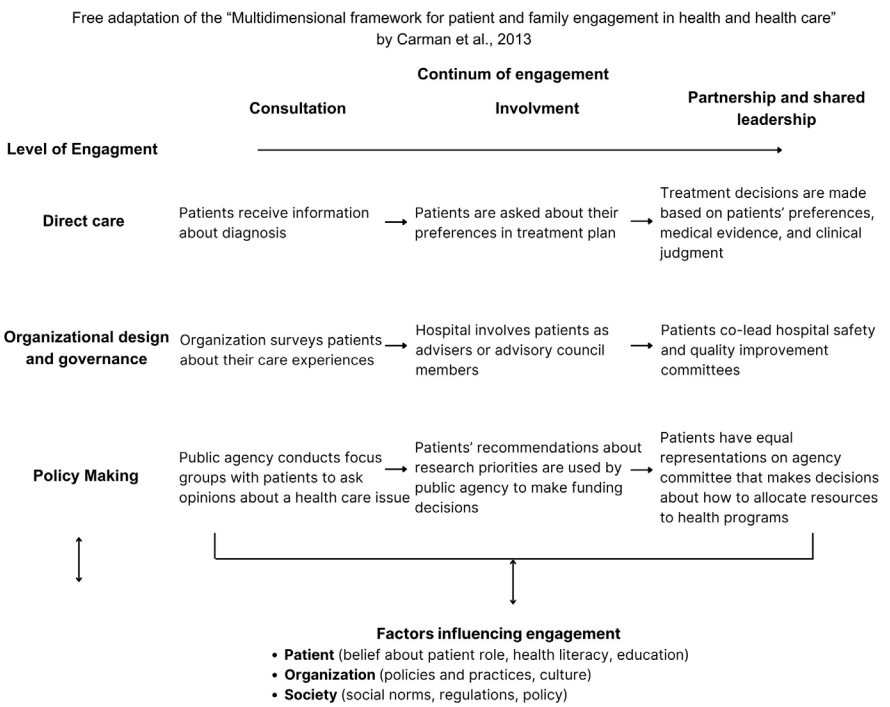
1. 'Multidimensional framework for patient and family engagement in health and healthcare' by Carman *et al*,[15] to describe the level and continuum of patient and family engagement. This framework subdivides the interventions into three possible level of actions: 'direct care', 'organisational design and governance' and 'policy-making'. In addition, the framework considers that PFE varies according to information flow and decision-making power, representing a continuum of engagement, including 'consultation', 'involvement' and 'partnership and sheared leadership'. Figure 1 shows the definitions of each level of action and continuum of PFE as reported by Carman *et al*.
2. SO4 subactions within the 'Global Patient Safety Action Plan 2021–2030'[6] to categorise according to the action level of the intervention, presented in figure 1.

Data extraction from each article was conducted independently by three authors (BFF+ASeyfulayeva and AShaikh+ASeyfulayeva), discrepancies were addressed via email and meetings. Publication year, country of implementation, type of surgical procedure, levels of engagement and subactions within the SO4 were characterised using absolute and relative frequencies.

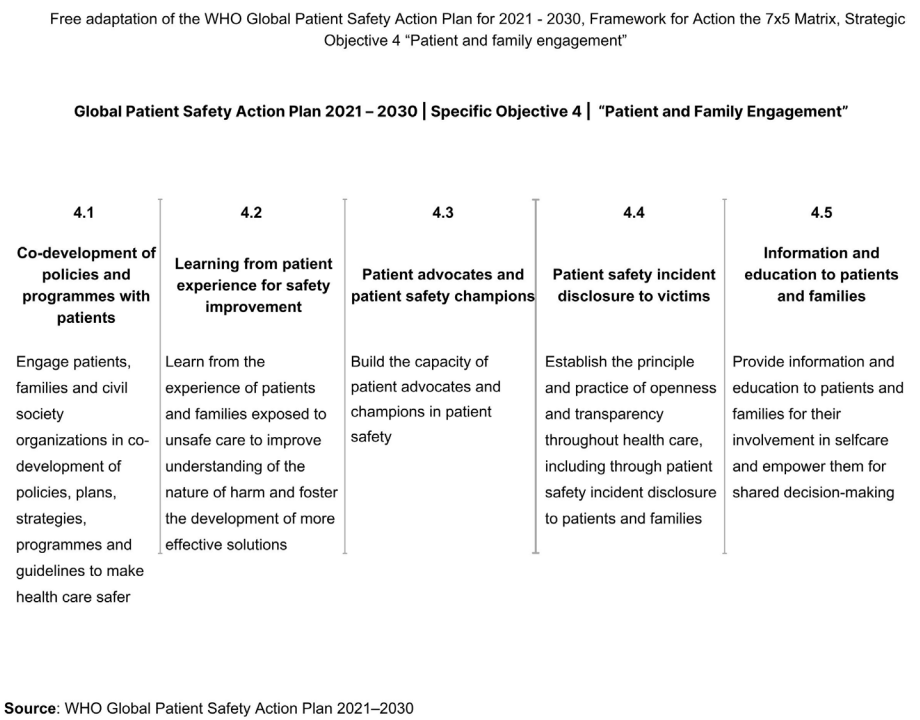
RESULTS

A total of 765 records were identified by applying the search query in 5 electronic databases, 93 records were duplicates, yielding 672 records which have been screened for 'title' and 'abstract'. After double screening of 'title' and 'abstract', 574 records were excluded while 98 were sought for retrieval. It was not possible to obtain full text of 10 reports, therefore, 4 corresponding authors were contacted via email and professional research librarian was contacted with the request to obtain the missing reports. Five reports were obtained through the research librarian, two reports were obtained from the corresponding authors and three were not retrieved. Out of 95 reports screened for full text, 63 were excluded (reasons for exclusion of each report are in online supplemental material S4 while 32 were deemed eligible for data extraction and analysis (figure 2).

Eligible articles were mainly published in the past 10 years (n=9, 28% between 2015 and 2016 and n=8, 25% between 2021 and 2022). PFE interventions were implemented in 11 different countries, majority originated in the USA (n=13, 41%), followed by the UK (n=6, 19%) and Canada (n=4, 13%). When it comes to the characteristics of the type of surgical patients, predominantly interventions were aimed at patients undergoing 'multiple/all types' of surgical procedures, that is, authors did not restrict their intervention to patients undergoing a specific type of surgical procedure (n=15, 47%), 19% (n=6) of the articles reported interventions focused on cardiothoracic surgical patients while 9% (n=3) were focused on gynaecological procedures. Table 1 reports the summary of the main characteristics



Source: Carman et al., 2013



Source: WHO Global Patient Safety Action Plan 2021–2030

Figure 1 Framework for data analysis of eligible studies. Free adaptation of the 'multidimensional framework for patient and family engagement in health and healthcare' by Carman *et al*[15] and free adaptation of the of the WHO Global Patient Safety Action Plan for 2021–2030, Framework for Action the 7×5 Matrix, Strategic Objective 4 'Patient and family engagement'.

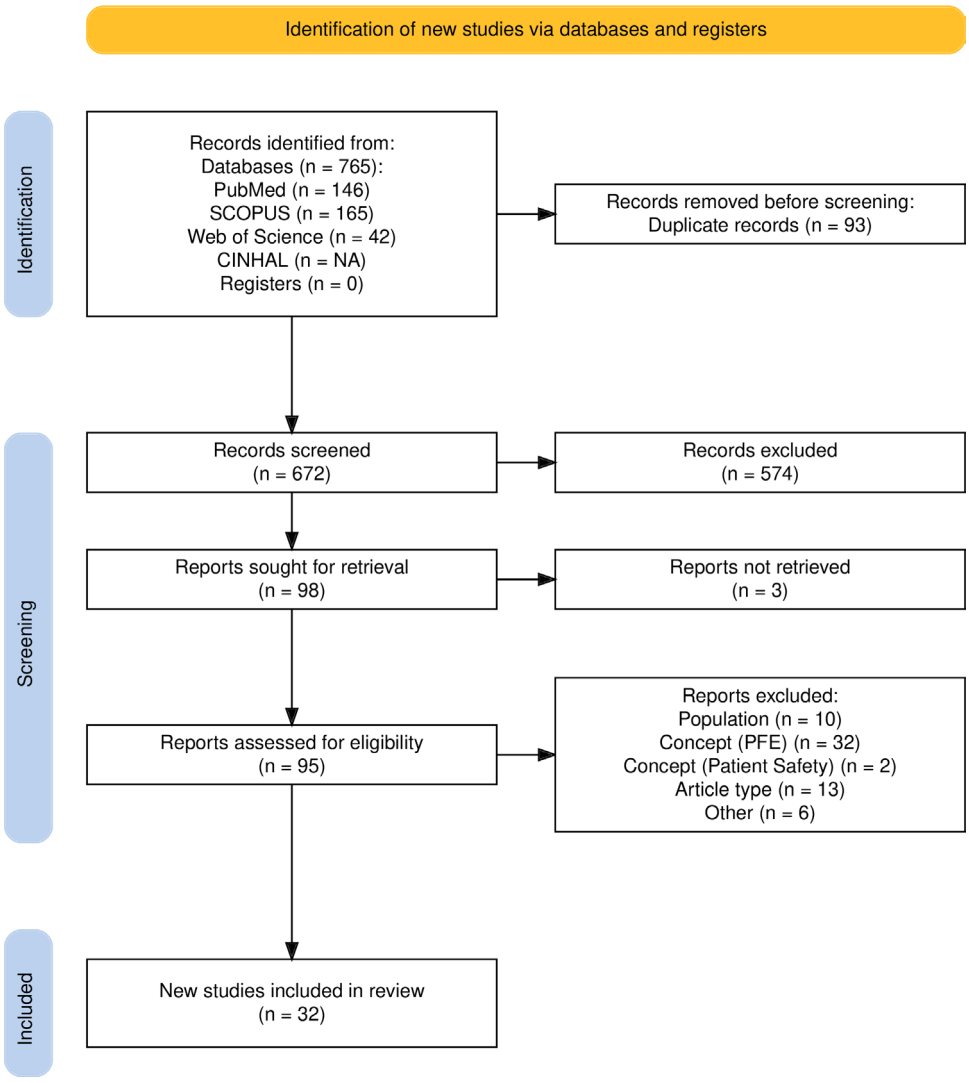


Figure 2 Flow diagram of selection of sources of evidence. Population, concept, article type: reasons for exclusion as defined in the methods section of the current scoping review. Source: Flow diagram constructed using Shiny app from: Haddaway *et al*[51]. PFE, patient and family engagement. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses.

of eligible studies and online supplemental material S5 provides detailed data extraction of each eligible article included in this review.

Level of action and continuum of PFE

A total of 28 studies, representing 88% (table 2) of patient safety interventions included in the current review, were focused on 'direct care'. Within 'direct care' level majority (n=14, 44%) of the interventions adopted 'consultation' type of PFE approach. These interventions focused on health literacy interventions through the provision of written patient information material for postoperative pain management,[21] information booklet and a diary for oncological patients age ≥65 years undergoing major surgery[22] or information regarding hand hygiene for patients during hospitalisation period in the surgical wards.[23] Digital formats of information provision were also identified such as, telenovela regarding kidney transplant process targeting Hispanic patients with the end-stage renal disease on the kidney transplant waiting list[24] or take-home video for prostate cancer patients who will be undergoing robotic-assisted laparoscopic prostatectomy.[25] Two studies in the UK reported the implementation of 'photo at discharge' with patients post cardiothoracic surgery use photo of the surgical site and tailored patient information material to prevent surgical site infection.[26 27] Online patient education courses and mobile application with tailored information for pregnant people undergoing caesarean delivery[28] were also included in the actions with PFE approach included in the 'direct care' level of engagement.

Within the 'direct care' level, 16% (n=5) of the interventions presented intermediate degree of engagement, that is, 'involvement'. Examples of such interventions include the implementation of 'Tell Us Card' tool for hospitalised surgical patients to be used as a way to convey concerns to the healthcare professionals during hospitalisation[29] and mobile applications to support

Table 1 Main characteristics of eligible studies included in this scoping review

Category	n	%*
Year of publication		
2007–2008	3	9.38
2009–2010	1	3.13
2011–2012	3	9.38
2013–2014	1	3.13
2015–2016	9	28.13
2017–2018	2	6.25
2019–2020	5	15.63
2021–2022	8	25.00
Country		
Canada	4	12.50
Denmark	1	3.13
France	1	3.13
Germany	1	3.13
The Netherlands	2	6.25
Norway	1	3.13
Singapore	1	3.13
Spain	1	3.13
Sweden	1	3.13
UK	6	18.75
USA	13	40.63
Type of surgery†		
Amputation	1	3.13
Colorectal	1	3.13
Orthopaedic	1	3.13
Prostate cancer	2	6.25
Gynaecological	3	9.38
Organ transplant	3	9.38
Cardiothoracic	6	18.75
Multiple/all types‡	15	46.88

*Percentage per category is calculated considering n=32 as 100%.
†Types of surgery: no specific medical classification system was used to classify the surgical patients in the data collection process of this study. For further information on the target population of each study, consult online supplemental material S5 of results.
‡Multiple/all types of surgical patients include articles which are targeted towards several types of surgical patients OR articles which did not specify which type of surgical patients were included in their intervention. For further information on the target population of each study, consult the Table of results in online supplemental material S5.

patients in preoperative and postoperative period with patient information material and patient-reported outcomes.[30]

Around 28% (n=9) of the interventions in the 'direct care' category had the highest type of engagement called 'partnership and shared leadership' which focuses on implementing user-friendly informed consent forms[31] and a variety of decision-making tools for example, question prompt lists,[32 33] tool to aid patients with heart failure to undergo a surgery to place a ventricular device[34] or methods to provide information which aims to enhance the ability of liver transplant patients decision-making process regarding the organ quality.[35]

At the 'organisational design and governance' (n=2, 6%) and 'policy-making' (n=2, 6%) levels the distribution was identical among the continuum of PFE engagement (table 2). At the organisational level, the PFE approach was adopted at the 'consultation' level in the development of a mobile application to aid postoperative period for cancer patients who underwent a colorectal surgery[36] and at the 'partnership and shared leadership' level to develop an OR Black Box—an intraoperative tool which records all the information of the surgical procedure.[37]

At the 'policy-making' level, patients were engaged in the development of the resumption to work guideline for gynaecological patients[38] and development and validation of the surgical patient safety checklist for surgical patients.[39]

Intervention subactions

Categorisation of the subactions of the patient safety interventions with the PFE approach indicates that 81% (n=26) (table 3) were targeted towards the provision of information and education to patients and/or their families. Around 16% (n=5) of the interventions were focused on the 'codevelopment of policies and programmes' among which are interventions regarding the enhanced version of informed consent,[31] development of patients' surgical checklist[39] and return to work guidelines for gynaecological patients.[38] One intervention was related to the action within SO4.3 (table 3), related to the establishment of a live donor champion programme for training champion nurses to provide care to live liver donors.[40] For further details regarding the classification of each article according to the level of PFE and WHO SO4 subactions, consult online supplemental material S5.

It is important to note that articles which reported patient engagement in the development of the PFE strategies were identified (online supplemental material S5). However, the intervention classification was solely restricted to the level, continuum and subaction of the developed/implemented intervention itself rather than the involvement in the research process.

DISCUSSION

The current review identified that interventions with PFE approach aimed at improving patient safety throughout the perioperative journey were focused on 'direct care' and predominantly implemented health literacy interventions, that is, interventions targeting SO 4.5 of the WHO Global Patient Safety Action Plan 2021—2030 entitled 'Information and education to patients and families'.[41] These findings align with those reported by a

Table 2 Classification of eligible articles according to the 'multidimensional framework for patient and family engagement in health and healthcare'

	Continuum of engagement							
	Consultation		Involvement		Partnership and shared leadership		Total	
Level of engagement	n	%*	n	%*	n	%*	n	%*
Direct care	14	43.75	5	15.63	9	28.13	28	87.50
Organisational design and governance	1	3.13	0	0.00	1	3.13	2	6.25
Policy-making	1	3.13	0	0.00	1	3.13	2	6.25
Total	16	50.00	5	15.63	11	34.38	32	100.00

*Percentage per category is calculated considering n=32 as 100%.

mixed-method systematic review by Cooper *et al*,[42] which analysed the operationalisation of the PFE interventions in direct care of the surgical patients who underwent major surgeries and a systematic review on PFE by Park and Giap.[7]

In discussing the results, it is important to note that the PFE in the research process itself was identified but not considered for classification of the PFE level, as the focus of the review was the level of engagement in the developed tool. This allowed not to overestimate the level of engagement of the studies eligible for the analysis in this review.

The results of the current review align with the systematic review conducted by Park and Giap[7] which reported that most of the eligible studies concentrated on engagement at the 'direct care' level, with fewer addressing 'organisational design and governance.' and no interventions pertaining to 'policy-making'.[7] These results mirror the findings of our analysis in the current scoping review, where the primary focus of interventions was on engaging patients in their direct care treatment plans. Similar trends were identified in the study by Cooper *et al* which reported that 51.7% of the interventions were related to the 'provision of information', 20.6% were related to 'communication' and 20.7% interventions focused on 'decision-making' and 'action-taking'.

Although predominant focus of PFE approach identified in current review was at 'direct care' level, two of the studies adopted PFE approach at organisational and policy-making levels. According to the systematic review of qualitative evidence conducted by Merner *et al*[43] on patients' engagement in the design, delivery and evaluation of the healthcare services (excluding direct care level), PFE has a positive impact on the participants and healthcare service. Patients who have engaged in group coproduction at the organisational and policy-making levels reported an increased sense of empowerment, confidence, skills and knowledge.[43] Meanwhile, healthcare providers value patients' unique perspectives, which can enhance care delivery.[43] Furthermore, this systematic review reports with high level of confidence, that PFE improves person-centredness, design, delivery and physical infrastructure of the healthcare services.[43] However, a systematic review by Lowe *et al*[44] (undertaken complementary to Merner *et al*[43]) was inconclusive regarding the impact of the PFE due to lack of high-quality evidence to analyse the impact of PFE.[44] Therefore, based on the benefits outlined by Merner *et al*[43] and challenges accessing its impact identified by Lowe *et al*,[44] as well as the scarcity of interventions at organisational and policy-making levels found in the current review, further high-quality research and interventions are needed at these levels to advance PFE in enhancing patient safety, with monitored outcomes for impact and sustainability.

The distribution of the interventions according to the subactions of the WHO SO four is similar to the trends reported in the systematic review by Cooper *et al*.[42] The majority of the interventions show 'consultation' level of

Table 3 Classification of eligible articles according to the WHO Global Patient Safety Action Plan 2021–2030, Specific Objective 4, 'Patient and family Engagement'

Global Patient Safety Action Plan 2021–2030, Strategic Objective 4, 'Patient and Family Engagement	n	%*
4.1 Codevelopment of policies and programmes with patients	5	15.63
4.2 Learning from patient experience for safety improvement	0	0.00
4.3 Patient advocates and patient safety champions	1	3.13
4.4 Patient safety incident disclosure to victims	0	0.00
4.5 Information and education to patients and families	26	81.25

*Percentage per category is calculated considering n=32 as 100%.

PFE and with more than 80% of eligible studies focused on SO 4.5 of the WHO Global Patient Safety Action Plan concerning information and education of the patients and their families/caregiver. These interventions take on a variety of formats ranging from verbal, written,[21 22] digital[45] or multimedia[24 25] education material. Our findings align with those of the scoping review on the health literacy interventions in surgical context conducted by Jaensson *et al*.[46] However, given that the patient education depends on timing, quantity, quality and method of the intervention, further research is required to establish guidelines for the development, implementation and monitoring of health literacy interventions concerning patient safety in surgical contexts.[46–48]

These result, concerning the extent of PFE and the focus of interventions suggest that efforts to enhance patient safety often involve one-way communication, where healthcare professionals provide information to patients, families and caregivers without fostering bidirectional information exchange or shared decision-making. Consequently, they question whether this form of PFE approach can be considered patient engagement or rather tokenism of engagement and participation with limited impact on quality, safety and democratisation of the healthcare services.[49]

LIMITATIONS

Although a research librarian was involved in the rigorous process of developing a search strategy for electronic databases, it is possible that relevant records were missed. A possible indication of that is the predominant number of interventions which focused on direct clinical and patient interaction, fewer on policy-making which can imply that keywords such as 'public involvement' and 'public' could have yielded a broader search result. Although the search strategy did not place any restriction on the type of PFE approach, the use of the term 'public' versus 'patient' could possibly have identified further studies of the engagement at the policy-making level. However, a study conducted by Sypes *et al*[50] on public involvement in low value care, predominantly used keyword as 'public involvement' and yielded overall similar trend as current scoping review, with higher prevalence of intervention focused on direct interaction between patient and physician. Thus, suggesting the under-representation of patients, familiar and caregivers at policy and organisational level is a tendency throughout different healthcare fields.

In addition, no grey literature was consulted for this review. This decision may have restricted the breadth of our findings. Grey literature, such as reports and policy papers, often contains valuable insights, particularly regarding PFE interventions at organisational and the policy-making level, which may not be captured in indexed peer-reviewed journals.

In addition, Carman *et al* PFE framework used in this review requires further definition of each group, to allow a more accurate classification of each intervention. The difficulties in classification were discussed by the multidisciplinary team of researchers involved in the screening process and although peer-reviewed, the distribution between the two extremes can be indicative of unclear classification groups.

CONCLUSION

The findings of the current review highlight that PFE interventions targeting patient safety are focused on the direct care level, particularly in the provision of patient information and education. However, a gap in research and interventions concerning organisational and policy-making levels was identified. Therefore, there is a pressing need for interventions that actively involve patients and families in broader organisational and policy-making contexts.

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Contributors ASe: Conception and design of the study, developed study protocol, implemented the study methods, wrote the manuscript, managed submission for journal publication, publication guarantor. BFF, ASh and AMA: Screened records, extracted data from eligible articles and revised the manuscript. PGCC: Contributed to the conception and design of the research question, provided consultation throughout data extraction and analysis and revised the manuscript. AL and ABN: Contributed to the conception and design of the research question, provided consultation throughout data extraction and analysis process, critically revised the initial draft of the manuscript, substantially contributed throughout the entire revision process of the manuscript, and approved the final version. AT, ND-K and PS: Contributed to the conception and design of the research question and revised and approved the manuscript.

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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 Ethics approval was not required as all data used in the study were obtained from previously published articles and existing literature. No primary data

collection involving human participants or animals was conducted, and all sources of data are publicly accessible

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available in a public, open access repository.

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