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ORIGINAL ARTICLE

A rapid evidence assessment of sickle cell disease educational interventions

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Abstract

Aims and objectives: To assess the impact of educational interventions on the knowledge and attitude of healthcare professionals (HCPs) regarding sickle cell disease (SCD) pain management in the UK.

Background: Variations and inadequate pain management due toHCPs' lack of knowledge and negative attitude is still an ongoing global concern for SCD patients despite availability of effective treatment and evidence-based guidelines. Several international studies have implemented interventions aimed at improving knowledge, attitude, and pain management. No review on the effectiveness of these interventions was found. Also, no previous intervention done in the UK was found from the thorough search of research databases. However, there are estimated 240,000 genetic carriers with about 12,500–15,000 estimated people living with SCD in the UK.

Design: Rapid Evidence Assessment of existing evidence.

Methods: A rapid evidence assessment was conducted between March 2021–January 2022 following the PRISMA 2020 guidelines. Included papers must have an educational intervention about SCD or related symptom management where the learners were HCPs. Excluded papers were those not published in English or before 2010. The following databases were searched: CINAHL, MEDLINE, PubMed America and Europe, Scopus, PsycINFO and Web of Science. Data quality was assessed using the Mixed Methods Assessment Tool (MMAT) and analysed using a narrative approach.

Results: Ten studies were included in the final review. Overall, they reported improved outcomes in six main themes: knowledge, attitude, perception, adoption, satisfaction and efficiency. Five studies reported statistically significant improvement in at least one outcome, four studies reported positive improvement, and two studies reported no significant improvement in knowledge and attitude. These heterogeneous studies were implemented once, and all designs were prone to bias; this makes it difficult to state how effective interventions are for SCD.

Conclusion: Current evidence of positive improvement in HCPs' knowledge and attitude is insufficient for generalisation and recommendation for adoption. However, we believe that implementing validated educational interventions remains essential for effective acute SCD pain management and patient-centred care. Further research is needed to find a suitable educational intervention that can be replicated.

Relevance to clinical practice: Quality SCD education, timely crisis management and reduced patient stigma are crucial in reducing the risk of rapid clinical decompensation to avoid developing life-threatening complications. Understanding SCD can also support the building of therapeutic relationships between the patient and practitioner.

Trial registration: This review was not registered.

KEYWORDS

acute pain management, attitudes, educational interventions, healthcare professionals, knowledge, nurses, perceptions, rapid evidence assessment, sickle cell disease, staff training

1 | INTRODUCTION

Sickle cell disease (SCD) is a chronic genetic haemoglobin disorder reported as one of the most common genetic severe diseases in the UK (Dormandy et al., 2017; National Institute for Care and Excellence (NICE), 2014; Sickle Cell Society, 2018). There are estimated 240,000 genetic carriers and about 12,500–15,000 people (about 1 in 4600) living with SCD in the UK (Dormandy et al., 2017; NICE, 2012). SCD is widely reported as affecting mostly people of South Asian, African and Mediterranean ethnicity (Angastiniotis et al., 2013; Bulgin et al., 2019). However, with intermarriages and SCD being genetic, it is impossible to exclude any group (Aguilar Martinez et al., 2014; National Academies of Sciences, Engineering, & Medicine, Health & Medicine, 2020; NICE, 2014). The ratio of people living with SCD in the UK is likely to have increased significantly due to higher immigration, intermarriages and new births in recent times (Angastiniotis et al., 2013; Bulgin et al., 2019; Inusa et al., 2019; Rees et al., 2011). SCD is characterised by debilitating acute pain episodes or vaso-occlusive crisis (VOC), which is the most common reason for hospitalisation, admissions and readmissions in patients with SCD (Al Zahrani et al., 2020; Masese et al., 2019; NICE, 2014). During VOC, SCD patients are at high risk of rapid clinical decompensation and developing life-threatening complications (renal failure, acute chest syndrome, stroke and sepsis; Abboud, 2020). Hence, there is a need for prompt medical intervention. However, delays and variations in pain assessment and management have led to SCD patients being admitted with longer hospital stay (Jenerette et al., 2016; Masese et al., 2019; NICE, 2014; Pernell et al., 2022). In 2012 and 2014, the UK and US departments of health, respectively, released guidelines with recommendations for the care of SCD patients with acute sickle cell pain in the ED (National Heart Lung and Blood Institute (NHLBI), 2014; NICE, 2014, 2012). However, poor pain management is still a frequent source of complaints among this patient group globally (Masese et al., 2019; Po et al., 2013; Telfer et al., 2014).

Reasons for variations and delays in pain management for SCD patients have been widely researched, especially in the emergency department (ED). Nurses (Ezenwa et al., 2017; Porter et al., 2012), ED physicians and haematologists (Haywood et al., 2013; Shapiro et al., 1997) fear that patients are drug-seeking. Researchers and SCD patients report healthcare professionals (HCP) show negative attitudes towards SCD patients and lack knowledge of SCD and pain management (Elander et al., 2011; Telfer et al., 2014; Yaqoob & Nasaif, 2015). Lack of staff training, experience, understanding, trust (Elander et al., 2011; Ezenwa et al., 2017; Telfer et al., 2014), disease stigma and racism (Freiermuth et al., 2014) and overwhelming high ED patient volume (Masese et al., 2019) have also been reported as responsible for the negative responses and attitudinal behaviours experienced by SCD patients.

Education has been widely used to improve negative provider attitudes and perceptions within oncology, haematology and especially emergency setting for SCD pain assessment and management. SCD-related educational interventions have been developed in the form of face-to-face teaching sessions (workshops/seminars, group

What does this paper contribute to the wider global community?

- This is the first review on this topic area and it shows that there is a lack of research knowledge on SCD pain management in the UK and persistent global deficit of knowledge among HCPs post educational intervention.
- Implementation of educational interventions can improve HCPs' knowledge and attitude towards SCD patients in a short period however, current evidence is insufficient to make generalisation and recommendation for adoption.
- This review highlighted lessons that could be beneficial for nurses, hospitals administrators, clinical educators, researchers, and university heads of nursing programme in planning new curriculums, policies, staff training and research development in the future.

TABLE 1 Keywords and search terms used to identify relevant studies

Key words	
training OR interventions OR education nurs* OR "healthcare professionals" "acute pain management" OR Crisis OR "pain episode" OR "pain management" "sickle cell anaemia" OR "Sickle cell disease" OR SCD	
Search terms	Databases
(training OR interventions OR education) AND (attitude OR knowledge OR behaviour) AND (nurs* OR healthcare professionals) AND ("acute pain management" OR Crisis OR pain OR "pain management") AND ("sickle cell anaemia" OR SCA OR "Sickle cell disease" OR SCD)	CINAHL, MEDLINE, Scopus, Psych-Info, Web of Science, Google scholar
("sickle cell anaemia" OR SCA OR "Sickle cell disease" OR SCD) AND (nurs* OR "healthcare professionals") AND (attitude OR knowledge OR behaviour) AND (training OR interventions OR education) AND ("acute pain management" OR Crisis OR pain OR "pain management")	PubMed Europe (PubMed-E) & PubMed America (PubMed-A)

discussion), SCD videos and websites to teach HCPs the pathophysiology, clinical complications and acute pain management of SCD. These interventions have been presented as flow charts/algorithms to implement guidelines or protocols for the management of SCD (Glassberg, 2017), SCD clinical data dictionary—a 'comprehensive learning healthcare system' in the electronic patient record (Miller et al., 2020), open-access SCD website for HCP and students (Kayle et al., 2016), and SCD-based course/curricula (Bulgin et al., 2019). The educational interventions are developed and implemented by researchers who are mainly haematology or oncology consultants/experts in SCD who also educate specialist nurses as face-to-face facilitators. Albeit, many of these published interventions originate from the USA, which appears to be leading the way in SCD research. Significantly, there is a dearth of educational interventions for English ED and other HCP who end up caring for SCD patients with comorbidities. Also, the 2018 report, 'I'm in Crisis' by the Sickle Cell and Thalassaemia All-Party Parliamentary Group (SCTAPPG), has called to improve HCP preparedness through increased representation of SCD in pre-registration nursing programmes (SCTAPPG, 2018). Furthermore, Yacoub et al. (2019) have emphasised the need for studies to evaluate the effects of various educational interventions reported to have improved HCP knowledge and practices regarding SCD pain assessment and management.

1.1 | Aim and objectives

This review therefore aims to answer the research question: 'what impacts have interventions had on the knowledge and attitude of HCPs regarding SCD pain management?' The objectives of the review are as follows:

1. To review current interventions and strategies used to improve HCPs' knowledge and attitude with regard to SCD patients and pain management.
2. To analyse and synthesise the impact achieved from implementing identified interventions and strategies.
3. To make appropriate recommendations relevant to practice with focus on the UK.

The methods adopted in exploring this research question are presented in the next section followed by the analysis of the result, an accompanying discussion and then the conclusion of the study.

2 | METHODS

To provide current and empirical evidence, a rapid evidence assessment (REA) method was adopted to review the literature between March 2021–January 2022. REAs are a shorter, quicker approach to gathering existing literature, consistent with the rigours of a systematic review (Department for International Development, 2015; Khangura et al., 2014). REAs can be used to inform policymakers, HCPs and consumers with reviews on evidence-based practice and indications (Varker et al., 2015). Hence, REAs are suitable for the time frame and the objectives of this study. The descriptors used in this REA follow the PICOT (population (sample size), Intervention, Comparison, Outcome and Time) approach (Baker-Smith et al., 2018; Page et al., 2021), and the review is reported following the PRISMA 2020 statement guideline (Page et al., 2021) as shown in Supplementary File 1.

2.1 | Inclusion and exclusion criteria

The included studies were selected based on participants and target population, intervention, comparator, outcomes and study design criteria (Bettany-Saltikov & McSherry, 2016). These were nurses or other healthcare professionals (HCPs) who have not previously received an SCD educational intervention. Selected interventions had outcomes that impact on the attitudes, knowledge or perceptions of HCP with regard to acute SCD pain management. Also, studies with outcome measures that encompass adoption/adherence, satisfaction/time to analgesia and efficiency were also included because such outcomes have been reported to affect effective acute SCD pain management (Glassberg, 2017; Gyamfi et al., 2021). Studies included were all empirical and peer-reviewed qualitative, quantitative or mixed-methods designs and conducted in all healthcare settings. The abstracts and full texts

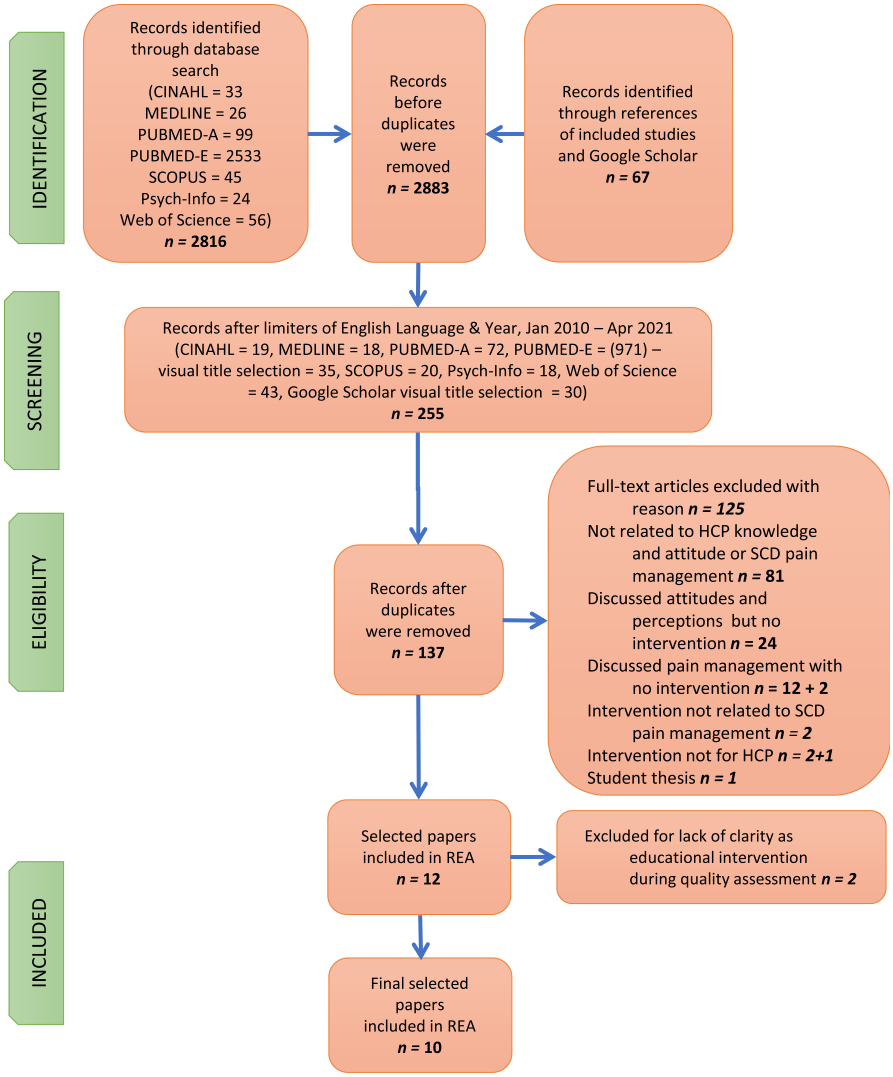

FIGURE 1 PRISMA flow chart

of all included studies are published in English, between 2010–2021. Studies were excluded if the interventions were systematic reviews, for patients and family members, and not to impact HCP knowledge and attitude.

2.2 | Search method

A broad search strategy was adopted by the authors and departmental librarian (protocol available on request). A combination of keywords was developed, and search terms were generated as shown in Table 1. A comprehensive multistep search was conducted using Boolean phrases and truncation to search for peer-reviewed articles in the following databases: CINAHL, MEDLINE, PubMed America and Europe, Scopus, PsycINFO and Web of Science. Search terms were modified for PubMed Europe and PubMed America (Table 1). A search was also conducted using Google Scholar for studies not published in the above databases, and a forward and backward reference list check was applied to all relevant articles, particularly to find available grey literature.

2.3 | Quality assessment

The ten included studies were heterogeneous; hence, the 2018 version of the Mixed Methods Appraisal Tool (MMAT; Hong et al., 2018) was used to assess the methodological quality of the included studies. The MMAT is a validated tool, designed to critically appraise different study designs using uniform criteria (Hong et al., 2019). The included studies were rated using quality scores ranging from 0–5 (0 = not meeting any criteria to 5 = meeting all five criteria). All papers were reviewed by the first three authors, and disagreements were dealt with by discussion.

2.4 | Data extraction and synthesis

A quantitative synthesis was undertaken using a predefined descriptive Excel matrix (Heyvaert et al., 2017) to record the study characteristics such as country, setting and target population, participants, intervention content, study design, intervention duration, length of follow-up, category of implementation, aim/objectives and study

TABLE 2 Study characteristics

Author/year Country	Sampling/participant	Intervention method	Intervention duration	Length of follow-up
Bernier et al. (2018) USA	Convenience sample of 22 (nurses = 18, PCA = 4) PCA (patient care assistant)	Educational intervention (based on David Kolb's theory of experiential learning) through: 1. Presentation—using slideshow on SCD and how to use the YAPFAQ tool per the author's recommendations 2. Semi-structured group discussions on best ways to use the YAPFAQ tool and current barriers to use the tool with recommendations led by the first two authors	**Slideshow** (20–40 min) **Group discussions**(10–30 min) During lunch break and shift changes	3 months
Diniz et al. (2019) Brazil	**153 healthcare providers** (physicians, nurses, dentists, social assistants, psychologists, physical therapists, physical educators, dieticians and others) enrolled in a distance education course: 'Sickle Cell Disease: Primary Health Care Line' **Random selection**	Distance education course developed (through student engagement in case study analysis, discussion forums and group activities with debate and reflection on the provision of professional care). Delivered via: 1. **virtual learning environment** with topics related to health surveillance actions targeting patients with SCD, management of acute events, sickle cell behaviour and other haemoglobinopathies. 2. Participants answered multiple-choice questions on knowledge of SCD using the **DFConhecimento instrument**	95 h	3 months
Gomes et al. (2015) Brazil	25 Community healthcare workers in the Family Health Program caring for patients with SCD. **Purposeful selection**	Educational workshops (training) —conducted by 3 nurses previously trained via a 90-hour distance learning course to deliver **six 5-hour workshops** and **homework** on training and changes implemented in daily caring and monitoring of patients with SCD	**40 h** (30 h in classroom, 10 h outside classroom) **over 7 days**	3 months
Hanik et al. (2014) USA	**36** healthcare staff **convenience sample**	1. Educational PowerPoint presentation with 2. Handout given to participants 'Sickle Cell Disease: Is the Pain Real?'	Not reported	Same day
Haywood et al. (2010) USA	267 clinicians (nurses and house staff) attending: 1. nurses retreat and 2. regularly scheduled noon conference for house staff **Random selection**	Educational 8-min video featuring an adult haematologist and three adult SCD patients discussing challenges in seeking treatment for SCD pain. Participant were asked to complete a survey	8 min	Same day
Haywood et al. (2015) USA	Retreat = 43 In-service = 103 **multidisciplinary team of clinicians** (physician, nurses, palliative care specialists, clinical psychologists, social workers, genetic counsellors, other specialists) **Purposeful (self) selection**	Two educational and experiential interventions (documentary video-based) of varying intensities— 1. High-intensity intervention (the 'Retreat')—didactic presentation, small group discussion based on 6 documentary videos over 2.5 days 2. Low-intensity intervention (the 'In-Service') —90 min during lunchtime or grand rounds	2.5 days (High-intensity intervention) 90 min (reduced-intensity intervention)	None reported immediately after intervention

(Continues)

TABLE 2 (Continued)

Author/year Country	Sampling/participant	Intervention method	Intervention duration	Length of follow-up
Jenerette et al. (2016) USA	**Attendance: Day 1 (T1)/day 2 (T2):** nurses = (37/19), nurse practitioners = 10/5, educators and social workers (others = 28/14), students = 8/10, patient = 15/14, family = 35/30, child = 2/25 **Survey respondents:** Pre-conference (T1) = 59, immediately post-conference (T2) = 38, 2 months post-conference (T3) = 30 **Convenience** selection	Educational SCD conference on the complexity of SCD titled: 'Improving Health for Individuals and Families Living with Sickle Cell Disease' Content covered: 1. care of adults, children and families living with SCD 2. assessment and treatment of pain. 3. common medical and psychosocial complications associated with SCD	2 days	Immediately after and 2 months post-conference
Kim et al. (2017) USA	Providers (pre/post)—15/21 Nursing staff (pre/post)—14/15 **Convenience sample**	1. **Developed and implemented EBPSC** (evidence-based practice standard care)—a visual algorithm flowchart based on National Heart, Lung and Blood Institute 2014 recommendations. 2. **7 formal education workshops/lectures**—10–15 min during monthly staff meetings using PowerPoint presentations, storyboards, **academic handouts** and posters and informal meetings from March 2015–March 2016 for **nursing staff** 3. **3 formal educational sessions**—30 to 60 min using PowerPoint presentation and informal face-face educational sessions for **providers**	17 months	6 months pre/post-implementation
Singh et al. (2016) USA	**96 ED providers**• nurses (57), • physicians (10), • residents (24), • midlevel providers (7) **Convenience** sample	**Virtual educational intervention (created an 8-minute online video)** featuring adult SCD patients and ED providers discussing challenges of SCD pain management from both patient and provider perspective to measure change in ED provider attitude	8 min	3 months
Yacoub et al. (2019) Egypt	**77 nurses** (37—intervention group; 40—control group) caring for patients with acute complications of SCD **Convenience sample**	Educational Intervention - an experienced nurse in both haematology and oncology unit **taught** 3 group sessions addressing the recommendations of NICE, 2012 and NHLBT, 2014 guidelines for SCD crisis management	2 days	**Control group**—same day **Intervention group**—3 weeks

outcomes. The discussions and recommendations of included studies were reviewed to elicit and extract lessons around feasible outcomes of implementation (Collins et al., 2015) and were synthesised qualitatively as secondary outcomes/lessons. Both primary and secondary outcomes were consecutively analysed using narrative synthesis and put into themes.

The initial search of the literature identified 2883 papers. Duplicates were automatically removed using ENDNOTE, and a review of the title and abstracts resulted in 137 potential papers. On full-text review, 125 papers were rejected, and a further two were rejected from the MMAT quality assessment. Ten peer-reviewed papers were included in this review. Details of the study selection process are presented in a modified PRISMA flow chart (Page et al., 2021) as shown in Figure 1.

3 | RESULTS

3.1 | Study characteristics

The characteristics of the 10 included studies are presented in Table 2 based on the PICOT approach (Baker-Smith et al., 2018). Seven studies were conducted in the USA, two in Brazil and one in Egypt. No study conducted in the UK was found during data collection for the period of this review. A majority of the studies from the USA were conducted within the same healthcare setting (emergency department) or region of the country. Likewise, the Brazilian studies were both conducted in the same state of Minas Gerais. Three studies had adult patients with SCD as their target population, two studies reported children only, two studies targeted both adults and children, while three studies just reported patients with SCD without stating age of the target population. Seven of the studies were conducted in healthcare settings, one study was in a university setting (Jenerette et al., 2016), and two studies were completed virtually (Diniz et al., 2019; Singh et al., 2016). Study designs varied among the 10 selected studies. Eight were quantitative, one was qualitative, and one was mixed-methods study. Studies were all single-intervention before-and-after studies.

3.2 | Participant characteristics

Study participants were nurses, health/practice care assistants (HCA/PCA), doctors, SCD expert providers (haematologists, oncologists and nurse practitioners), student nurses and multidisciplinary team (MDT) of healthcare staff/clinicians (nurses, doctors, SCD expert providers, educators, social workers, HCA/PCA, psychologists, genetic counsellors, physical therapists, physical educators, dieticians and others) involved in the care patients with SCD. Two studies reported the participants working in ED or urgent care unit, four other studies had HCP from specialist SCD units such as haematology and oncology unit, and palliative care programme, and three studies were in patients or those from medical care centres. The study sample size ranged from 22–267 participants. The studies used convenience, random or purposeful sampling. Kim et al. (2017) used a combination of convenience sampling and retrospective review of electronic medical records to compare mean waiting time with the first administration of analgesia.

3.3 | Study interventions and strategies for implementation

This section discusses research activities contributing to fulfilling the first study objective. The object concerns assessing interventions and strategies implemented to improve HCP knowledge and attitude in SCD pain management identified from the literature.

The identified studies all reported educational programmes as their method of intervention, however, with different contents, strategies of implementation, aims and outcome measures (see Table 2). The different strategies of implementations are classified into four categories: face-to-face teaching ($n = 9$), visual aid ($n = 2$), independent learning ($n = 5$; homework = 1, handout = 1, podcast = 1 and Web-based SCD module = 2), and the use of protocol/guideline or pain assessment tools ($n = 4$). Eight of the face-to-face teaching interventions are mostly in the form of didactic/lecture presentations, group works/discussions, or combined other strategies such as visual aid such as viewing videos about SCD (Haywood et al., 2010, 2015; Singh et al., 2016) except one study (Jenerette et al., 2016) that didactically taught the participants the complexity of SCD, care of patients and their families. The independent learning category used podcast (Singh et al., 2016), interactive Web-based SCD modules (Diniz et al., 2019) or the method of reading study materials or completing post-study task (Gomes et al., 2015; Hanik et al., 2014). Two studies (Kim et al., 2017; Yacoub et al., 2019) adopted protocols based on evidence-based guidelines to improve knowledge. Another study (Bernier et al., 2018) used SCD pain assessment tools deduced to encourage objective pain scoring, improvement in HCP knowledge and pain management. The content of interventions was developed from different theories. Bernier et al. (2018) developed their pain assessment tool using David Kolb's 1984 theory of experiential learning combined with the Youth Acute Pain Functional Ability Questionnaire (YAPFAQ) developed and validated by Zempsky et al. (2014). Most interventions were delivered by SCD experts (haematologists, oncologists and nurse practitioners).

Study interventions were mostly uncontrolled quasi-experimental designs and differed in length, period of follow-up and strategy of implementation. Interventions lasted between eight minutes (Haywood et al., 2010; Singh et al., 2016)–17 months (Kim et al., 2017) during lunch breaks and shift changes (Bernier et al., 2018) and planned conferences and retreats (Haywood et al., 2015). One study did not report the length of interventions (Hanik et al., 2014). Follow-up for study participants post–intervention was very short ranged from immediately after the interventions (Haywood et al., 2015) to six months post-intervention (Kim et al., 2017). One study

reported two months post-intervention (Jenerette et al., 2016), three studies reported three months post-intervention (Bernier et al., 2018; Diniz et al., 2019; Gomes et al., 2015), and the rest measured the outcome on the same day. These variations in follow-up timing and length could influence the outcome and are a significant source of bias in pre- and post-test studies. Variations in strategies also make comparison difficult, especially between interventions that used study-specific protocol and those that just adopted didactic teaching approaches.

3.4 | Reported impact/outcomes of study interventions and strategies

A narrative synthesis was applied to the findings of each paper, as this allows for different methods of research to be brought together and interpreted as an account of what happened because of each intervention (Allen, 2017). As each of the included papers used different methods and measurements, the first author collated the findings by rethematising them into six main outcomes: knowledge, attitude, perception, adoption, satisfaction and efficiency. The third author reviewed the findings to ensure accuracy in reporting. Only one study (Kim et al., 2017) measured all six outcomes reported in this review due to the multifaceted intervention design.

3.5 | Outcome 1: Positive improvement in knowledge

Five different studies (Bernier et al., 2018; Diniz et al., 2019; Jenerette et al., 2016; Kim et al., 2017; Yacoub et al., 2019) assessed knowledge with varying outcomes. One randomised controlled trial (RCT; Yacoub et al., 2019) and two descriptive quantitative studies (Diniz et al., 2019; Jenerette et al., 2016) report overall statistically significant improvement in knowledge of SCD post-educational intervention. Diniz et al. (2019) reported the significant difference in the knowledge of SCD among HCPs who concluded the distance education course on SCD that was sustained for three months. Participants of Jenerette et al.'s (2016) study showed significant improved knowledge in SCD with a score of 82% immediately after a two-day educational conference answering survey questions. However, this improvement in knowledge was only sustained for a short period of two months after which participants' knowledge score reduced to 52% from lack of retaining information. Yacoub et al. (2019) reported a significant positive increase in knowledge scores from 46.1% pretest–81.1% post-intervention and across different SCD knowledge categories sustained for a short period of three weeks. Yacoub et al also reported the lack of SCD knowledge pre-intervention was not related to the nurses' personal demographics (age or nursing experience) but could be due to the lack of continuing education opportunities and support for nurses caring for SCD patients to improve knowledge and practices. One descriptive quantitative study (Kim et al., 2017) reported improvement (not statistically significant) in knowledge and awareness of rapid pain management within 30 min of triage and sustained six months post-implementing the use of EBPSC algorithm.

In contrast, the mixed-methods study (Bernier et al., 2018) reported no significant change in knowledge after their intervention indicating poor provider choice of intervention period (lunch breaks and shift changes) as a possible reason for the lack of significant change in knowledge. However, Bernier et al. (2018) reported participants having a better knowledge of who completes the pain assessment tool.

3.6 | Outcome 2: Improvement in attitude

Six studies assessed attitude using several measures. Five studies (Hanik et al., 2014; Haywood et al., 2010, 2015; Jenerette et al., 2016; Kim et al., 2017) reported positive improvement in attitude with no statistical significance. Hanik et al. (2014) reported a lack of statistically significant change in attitude after implementing a one-time PowerPoint presentation with handouts on SCD and healthcare legislation. Hanik and colleagues reported the improvement in attitude was not significant possibly due to timing of the training sessions not convenient for other participants, small sample size, social desirability bias, immediate outcome measurement post-intervention and the need for additional interventions. Two studies (Haywood et al., 2010 and Haywood et al., 2015) both used video-based documentary interventions. Haywood et al. (2010) reported a decrease in the negative attitude, decreased endorsement of concern-raising behaviours and increased positive attitude towards patients with SCD immediately after viewing an 8-minute video of the negative experience of SCD patients with HCPs. Subsequently, the same group of authors (Haywood et al., 2015) reported similar SCD video but of two intensities (low intensity—90-minute in-service seminar with short debrief discussion; and high intensity—6 documentary videos with group discussion over 2.5-day retreat) that positively affect provider attitude immediately post-intervention. When combined, the interventions were reported to have a greater positive effect on all four attitudes of HCPs towards paediatric SCD patients.

Jenerette et al. (2016) reported a decrease in negative attitude sustained over a period of 2 months after a 2-day conference on the complexity of SCD. The respondents were a convenience sample of HCPs around two hospitals with paediatric and adult sickle cell programmes also from the south-east of America. The change in attitude was measured using Haywood et al.'s (2010) General Perceptions about Sickle Cell Patients Scale survey emailed to HCPs pre- and post-conference and paper format immediately after the conference with no unique identifiers or repeat measurement analysis. Singh et al. (2016) indicated a statistically significant improvement in attitude with a subscale of decrease in negative attitude from 40.8–29.3, improvement in positive attitudes from

34.8–44.8, and a decrease in endorsement of red-flag behaviours from 64.8–52.1 different from baseline and sustained on repeat testing three months after ED staff watched an 8-minute video on SCD.

3.7 | Outcome 3: Positive perception

Two studies reported on perception from different perspectives but with statistically significant improvement. Gomes et al. (2015) implemented 6 educational workshops over 7-day interval on the care and monitoring of patients with SCD. Three months post-intervention, Gomes et al. reported the tape-recorded and transcribed HCP's perception stating the educational intervention changed their perception in form of improved knowledge on how to handle priapism, medication and enlarged spleen. Also, there was a positive change in daily healthcare practices of participating community health workers such as prioritising care and treatment for patients with SCD, and care for the child with warning signs. Kim et al. (2017) reported both positive HCP and patient perception. There was a positive decline in the percentage (57.1% pre-intervention to 33% post-intervention) of HCPs who perceived SCD patients as drug-addicted. Likewise, patients reported receiving increased respect, empathy from 23.1%–64% pre- and post-intervention and increased shared decision-making of acute pain management from 26.6%–68%

3.8 | Outcome 4: Non-adoption/adherence of pain assessment tool or guideline

Bernier et al. (2018) reported non-adoption as no significant difference in staff rates of assessing and documenting pain assessment tool. These authors identified 55 barriers statements reported by the participants, which were further summarised into three categories (personal, physical and patient-related barriers) as reason for non-adoption. Kim et al. (2017) also reported system factors (overcrowding, unpredicted high volume of patients in the urgent care (UC) setting, prioritising patients with stroke, trauma, sepsis and heart disease) and barriers (resistance to change, non-acceptance of the evidence, non-adherence by the UC team and lack of understanding of the importance of the Evidence-Based Practice Standard of Care (EBPSC) algorithm for the management of acute SCD pain) as potential reasons that interfered with the UC team adopting the EBPSC algorithm for SCD. Kim et al. (2017) also called for further research into the barriers between EBPSC and HCP's daily practice in an attempt to improve the management of acute SCD pain in multiple care settings.

3.9 | Outcome 5: Increased patient satisfaction

Only one study in this review explicitly assessed patient satisfaction pre-implementation and post-implementation of the EBPSC algorithm for SCD. Kim et al. (2017) reported statistically significant increased patient satisfaction from 23.1%–68% ($p = .002$) with acute pain management due to HCPs adhering to the EBPSC algorithm guidelines and recommendations including education 6 months post-intervention. Outcome data for patient satisfaction with pain management in a SCD urgent care centre were collected through a 9-item survey developed by the author following a literature review of SCD pain management in the ED. Kim and colleagues concluded that educating HCPs about the function and need of SCD pain assessment tool and management guideline is essential for improved SCD pain management, better patient experience and routine quality and standard care of SCD patients.

3.10 | Outcome 6: Improved efficiency

Kim et al. (2017) and Yacoub et al. (2019) assessed efficiency as improved staff clinical performance leading to a statistically significant positive decline in time to first analgesia from triage on using intervention protocols or tools for acute SCD pain management. Kim et al. (2017) reported a decline of 58.7 to 36.7 min ($p = .001$) post-implementation of their EBPSC algorithm, which also led to reduced length of stay (LOS) in the UC setting. Kim et al. (2017) also reported inadequate pain assessment tool and the lack of communication channels during intervention implementation were the greatest barriers to rapid pain management. Yacoub et al. (2019) reported a positive increase in performance of correct nursing care practices after a 2-day didactic teaching on NICE (2012) and NHLBI (2014) clinical practice guidelines and recommendations for the prompt assessment and acute SCD pain management. Data collected on clinical practices such as medication administration performed and documented by nurses in the control group indicated significantly decreased mean time of first analgesia administration from 92–62 min. Also, there was increased performance of correct nursing practices (non-pharmacological complementary approaches) such as gentle massage, auscultation and reassessment of pain intensity post-intervention.

4 | DISCUSSION

In assessing current interventions and strategies for improving HCP knowledge and attitudes towards SCD patients and acute pain management, this review found 10 eligible studies' different interventions implemented through four categories of teaching and learning strategies. This study collated the outcomes and lessons learned. Study interventions were heterogeneous, implemented once, and designs were prone to bias. Hence, it is difficult to make an accurate judgement of the degree of effectiveness or impact on HCPs and consequently SCD patients.

Search outputs from research databases suggest that this REA is the first to evaluate the impact of educational interventions relating to improving HCPs' knowledge and attitude towards SCD

patients and acute SCD pain management. The results and inferences presented in this review align with two previous systematic reviews (Gyamfi et al., 2021; Häggman-Laitila et al., 2017). Häggman-Laitila et al. (2017) reviewed outcomes of educational interventions relevant to only nurses regarding guideline implementation on different clinical problems using four databases and paper references and found 13 different studies with 13 different educational interventions (10 from the USA and one each from Australia, Singapore and Iran) from 2008–2015. Gyamfi et al. (2021) reviewed RCTs on evidence-based interventions implemented in low- and middle-income countries (LMIC) for SCD management using nine databases and grey literature and found 30 studies with 29 RCT conducted in 14 LMICs. However, the 10 selected studies in this review are different from those included in the final data of these interesting systematic reviews in question, albeit, with similar results. These reviews concluded implementation of ten heterogeneous interventions that were delivered in local settings, with different measurements used to determine outcomes. A narrative analysis of these studies suggests that there is a need for future studies to test the sustainability of outcomes and repeatability of the intervention methods adopted, further indicating that current educational interventions aimed at improving HCP knowledge and attitude to effectively manage acute SCD pain are widely varied and lack certainty of evidence for long-term sustainability. Consequently, there is a global deficit of knowledge among HCPs to effectively manage acute pain episodes of SCD patients.

Also, all the included studies were written in English and conducted mostly in the USA with only two in Brazil, one in Egypt and none from the UK. Sample sizes of the studies reviewed were small with participants mainly from ED, haematology and oncology where SCD patients are regularly cared for. Hence, the impacts reported in these studies may not be generalisable to HCPs working in other wards where SCD patients are admitted due to complex comorbidities, shortage of bed or the guidelines applicable in other countries.

The studies differed in content, implementation strategy, length of study, participants and outcome measure, hence making synthesis of the result and verifying the correlation of the extent of associated impact difficult. The intervention outcomes were mostly immediate pre- and post-test known to be prone to confounding bias of the Hawthorne effect (Grimshaw et al., 2000; McCambridge et al., 2014), which could lead to an overestimation of effectiveness of the study interventions and strategies. Likewise, the two RCTs (Haywood et al., 2010; Yacoub et al., 2019) with Haywood et al. (2010) as a post-test—only control study—were one-time before-and-after interventions with very short follow-up period of 1- and 3-week post-study (Yacoub et al., 2019). The situation is the same across the study interventions with only (Kim et al., 2017) reporting a follow-up of six months post-intervention causing uncertainty in the long-term sustainability of the effect of the intervention outcomes. Additionally, outcome data were self-reported using questionnaires and surveys (participants were not always observed during implementation), and responses may have been over- or under-reported or responded by someone else, which is a common source of social disability and selection bias (Ellis, 2013). Hence, there is a difficulty in verifying the correlation and extent of associated impact, which could affect the interpretation of results. Therefore, results from the included studies and their interventions should be treated with great caution.

5 | CONCLUSION

This review has shown that educational interventions vary, and strategies of implementation for SCD are heterogeneous. It is also evident that there is a persistent deficit of knowledge of SCD pain management among HCPs post-intervention. Implementation of educational interventions can improve HCPs' knowledge and attitude towards SCD patients in a short period. However, the long-term effect and the effect of patient satisfaction and perception remain uncertain. Also, current evidence is insufficient to make generalisation and recommendation for adoption. However, implementing validated educational interventions to improve HCPs' knowledge and attitude remains essential for effective acute pain management and developing care for SCD patient-centred care. Future longitudinal and RCT studies are needed to test the effectiveness of educational interventions in different healthcare settings to ensure replication, comparison and, ultimately, sustainability.

5.1 | Strengths and limitations

Results of a thorough search of research databases suggest that there have been no previous rapid evidence assessments carried out on educational interventions for SCD aimed at HCPs. This study is therefore an important review of the impact of current educational interventions and strategies of implementation related to the improvement in healthcare professional's knowledge and attitude for the effective SCD pain assessment and management. Nevertheless, this review has some limitations considered in relation to the included studies. The heterogeneity of the included papers, variations in strategies of implementation and measurement restricted the synthesis of the results. Common with REAs, this study did not include any grey literature in the final selected publications, and these were restricted to articles in the English language. Such criteria increase the chances of missing relevant unpublished and non-English studies, thereby introducing selection and publication bias.

It is important to emphasise that the results of this review are in line with recent systematic reviews of educational interventions on similar themes aiming to improve HCP knowledge and attitude regarding acute SCD pain management. The need for effective pain management for SCD patients is global, and developing evidence-based educational interventions cuts across the multidisciplinary team of HCPs, especially those caring for this growing patient group.

5.2 | Recommendations

Due to the heterogeneity and uncertainties regarding the effects of the results, this study cannot make definite recommendations with certainty. Sampson et al., (2014) also cautioned there is no "magic bullet intervention" that would be generalisable to different settings and rather recommend further robust RCT to evaluate stronger theoretical framework interventions with improved pain management for specific healthcare settings with reasons for success. However, the researchers believe that the following recommendations should be considered:

- Future studies should carefully consider and clearly define outcome measures that include patient satisfaction and perspective of the impact of intervention.
- There is a need for incorporating a validated and standardised SCD pain assessment tool (that will allow for replication and comparison) into the workflow of HCP.
- There is a need for longitudinal studies to establish sustainability of impact over longer period.
- There is a need for training and recruiting SCD specialist nurses to provide continuous training and MDT support.
- There is an effective integration of SCD and pain management in the teaching curriculum for nursing and medical students.

6 | RELEVANCE FOR CLINICAL PRACTICE

The lack of educational training on SCD in the UK is surprising. Quality SCD education, timely crisis management and reduced patient stigma are crucial in reducing the risk of rapid clinical decompensation to avoid developing life-threatening complications. This review highlighted some lessons from the included studies that could be beneficial for hospital administrators, clinical educators, researchers and academic administrators in planning new curriculums, policies, staff training and research development in future. One important clinical relevance is the need for training advanced/specialist SCD nurses to support nurses and other HCP caring for this patient group. Specialist nurses through education, research and clinical practice (Kailainathan et al., 2018) have been evidenced in providing support and building the capacity of nurses and other HCP in managing patient illness. Hence, in practice, advanced/specialist SCD nurses will help to bridge both communication gap and the use of agreed validated pain assessment tools and treatment algorithm. Moreover, the need for integrating SCD education in health care has been global (Lal, 2018). SCD has been previously used as an example for a disease-focused course with a global perspective (Bulgin et al., 2019). Hence, a careful consideration of teaching strategies that can incorporate SCD and pain management education into pre-registration programmes, trust/preceptorship induction days, staff statutory training and nursing workflow should be considered. Future studies are recommended to validate these suggestions.

AUTHORS' CONTRIBUTIONS

Conception and design, data acquisition, and analysis and interpretation of data: Anthonia Etonlogbo Oti; manuscript drafting: Anthonia Etonlogbo Oti and Kim Heyes; critical revision of the manuscript for important intellectual content: Anthonia Etonlogbo Oti, Kim Heyes and Danita Wilmott; quality checks: Anthonia Etonlogbo Oti, Kim Heyes and Faye Bruce; supervision of the aspects of research: Faye Bruce; development of original research idea: Anthonia Etonlogbo Ot and Danita Wilmott. Each author participated sufficiently in the work and takes public responsibility for the content; and is accountable for all aspects of the work in ensuring the accuracy and integrity of all investigations carried out.

CONFLICT OF INTEREST

The authors state that there are no conflict of interests or ethical considerations required.

DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available in the article and supplementary material of this article.

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REFERENCES

Abboud, M. R. (2020). Standard management of sickle cell disease complications. *Hematology/Oncology and Stem Cell Therapy*, *13*(2), 85–90. https://doi.org/10.1016/j.hemonc.2019.12.007

Aguilar Martinez, P., Angastiniotis, M., Eleftheriou, A., Gulbis, B., Mañú Pereira, M. D. M., Petrova-Benedict, R., & Corrons, J.-L.-V. (2014). Haemoglobinopathies in Europe: Health & migration policy perspectives. *Orphanet Journal of Rare Diseases*, *9*(1), 97.

Al Zahrani, O., Hanafy, E., Mukhtar, O., Sanad, A., & Yassin, W. (2020). Outcomes of multidisciplinary team interventions in the management of sickle cell disease patients with opioid use disorders: A retrospective cohort study. *Saudi Medical Journal*, *41*(10), 1104–1111. https://doi.org/10.15537/smj.2020.10.25386

Allen, M. (2017). *The sage Encyclopedia of communication research methods* (Vols. *1–4*). SAGE Publications, Inc. https://doi.org/10.4135/9781483381411

Angastiniotis, M., Vives Corrons, J.-L., Soteriades, E. S., & Eleftheriou, A. (2013). The impact of migrations on the health services for rare diseases in Europe: The example of haemoglobin disorders. *The Scientific World Journal*, *2013*, 1–10. https://doi.org/10.1155/2013/727905

Baker-Smith, C. M., Flinn, S. K., Flynn, J. T., Kaelber, D. C., Blowey, D., Carroll, A. E., Daniels, S. R., de Ferranti, S. D., Dionne, J. M., Falkner, B., Gidding, S. S., Goodwin, C., Leu, M. G., Powers, M. E., Rea, C., Samuels, J., Simasek, M., Thaker, V. V., & Urbina, E. M. (2018). Diagnosis, evaluation, and management of high blood pressure in children and adolescents. *Pediatrics*, *142*(3), e20182096. https://doi.org/10.1542/peds.2018-2096

Bernier, K. M., Strobel, M., & Lucas, R. (2018). Assessing the effect of an educational intervention on nurses' and patient care assistants' comprehension and documentation of functional ability in pediatric

patients with sickle cell disease. *Journal of Pediatric Nursing*, *41*, 117–122. https://doi.org/10.1016/j.pedn.2018.04.001

Bettany-Saltikov, J., & McSherry, R. (2016). *How to do a systematic literature review in nursing: A step-by-step guide* (2nd ed.). McGraw-Hill Education: Open University Press.

Bulgin, D., Tanabe, P., Asnani, M., & Royal, C. D. M. (2019). Twelve tips for teaching a comprehensive disease-focused course with a global perspective: A sickle cell disease example. *Medical Teacher*, *41*(3), 275–281. https://doi.org/10.1080/0142159X.2017.1420151

Collins, A., Coughlin, D., Miller, J., & Kirk, S. (2015). 'The production of quick scoping reviews and rapid evidence assessments: A how to guide.'

Department for International Development(2015). *Rapid Evidence Assessment*. [Online] [Accessed on 15/03] https://www.gov.uk/government/collections/rapid-evidence-assessments

Diniz, K. K. S., Pagano, A. S., Fernandes, A. P. P. C., Reis, I. A., Pinheiro Júnior, L. G., Torres, H. D. C. (2019). Knowledge of professional healthcare providers about sickle cell disease: Impact of a distance education course. *Hematology, Transfusion and Cell Therapy*, *41*(1), 62–68. https://doi.org/10.1016/j.htct.2018.06.004

Dormandy, E., James, J., Inusa, B., & Rees, D. (2017). How many people have sickle cell disease in the UK? *Journal of Public Health*, *40*(3), e291–e295.

Elander, J., Beach, M. C., & Haywood, C. J. (2011). Respect, trust and management of sickle cell disease in pain in hospital: A comparative analysis of concern-raising behaviours, preliminary model, and agenda for international collaborative research to inform practice. *Ethnicity & Health*, *16*(4–5), 405–421.

Ellis, P. (2013). *Understanding research for nursing students (transforming nursing practice series)* (3rd ed.). Sage and Learning Matters.

Ezenwa, M. O., Yao, Y., Molokie, R. E., Wang, Z. J., Mandernach, M. W., Suarez, M. L., & Wilkie, D. J. (2017). Coping with pain in the face of healthcare injustice in patients with sickle cell disease. *Journal of Immigrant and Minority Health*, *19*(6), 1449–1456. https://doi.org/10.1007/s10903-016-0432-0

Freiermuth, C. E., Haywood, C. J., Silva, S., Cline, D. M., Kayle, M., Sullivan, D., Thornton, V., & Tanabe, P. (2014). Attitudes towards patients with sickle cell disease in a multi-center sample of emergency department providers. *Advanced Emergency Nursing Journal*, *36*(4), 335.

Glassberg, J. A. (2017). Improving emergency department-based care of sickle cell pain. *Hematology*, *2017*(1), 412–417. https://doi.org/10.1182/asheducation-2017.1.412

Gomes, L. M. X., de Andrade Barbosa, T. L., Vieira, E. D. S., Vieira, L. J. T., Castro, K. P. A. N., Pereira, I. A., Caldeira, A. P., de Carvalho Torres, H., & Viana, M. B. (2015). Community healthcare workers' perception of an educational intervention in the care of patients with sickle cell disease in Brazil. *Mediterranean Journal of Hematology and Infectious Diseases*, *7*, e2015031. [Online] 1. http://europepmc.org/abstract/MED/25960859; https://doi.org/10.4084/MJHID.2015.031; [Accessed on 2015] https://europepmc.org/articles/PMC4418403?pdf=render

Grimshaw, J., Campbell, M., Eccles, M., & Steen, N. (2000). Experimental and quasi-experimental designs for evaluating guideline implementation strategies. *Family Practice*, *17*(suppl_1), S11–S16. https://doi.org/10.1093/fampra/17.suppl_1.S11

Gyamfi, J., Ojo, T., Epou, S., Diawara, A., Dike, L., Adenikinju, D., Enechukwu, S., Vieira, D., Nnodu, O., Ogedegbe, G., & Peprah, E. (2021). Evidence-based interventions implemented in low-and middle-income countries for sickle cell disease management: A systematic review of randomized controlled trials. *PLoS One*, *16*(2), e0246700. https://doi.org/10.1371/journal.pone.0246700

Häggman-Laitila, A., Mattila, L. R., & Melender, H. L. (2017). A systematic review of the outcomes of educational interventions relevant to nurses with simultaneous strategies for guideline implementation. *Journal of Clinical Nursing*, *26*(3–4), 320–340. https://doi.org/10.1111/jocn.13405

Hanik, M., Sackett, K. M., & Hartman, L. L. (2014). An educational module to improve healthcare staffs' attitudes toward sickle cell disease patients. *Journal for Nurses in Professional Development*, *30*(5), 231–236. https://doi.org/10.1097/NND.0000000000000058

Haywood, C. J., Lanzkron, S., Hughes, M. T., Brown, R., Massa, M., Ratanawongsa, N., & Beach, M. C. (2010). A video-intervention to improve clinician attitudes toward patients with sickle cell disease: The results of a randomized experiment. *Journal of General Internal Medicine*, *26*(5), 518–523. https://doi.org/10.1007/s11606-010-1605-5

Haywood, C. J., Tanabe, P., Naik, R., Beach, M. C., & Lanzkron, S. (2013). The impact of race and disease on sickle cell patient wait times in the emergency department. *The American Journal of Emergency Medicine*, *31*(4), 651–656. https://doi.org/10.1016/j.ajem.2012.11.005

Haywood, C. J., Williams-Reade, J., Rushton, C., Beach, M. C., & Geller, G. (2015). Improving clinician attitudes of respect and trust for persons with sickle cell disease. *Hospital Pediatrics*, *5*(7), 377–384. https://doi.org/10.1542/hpeds.2014-0171

Heyvaert, M., Hannes, K., & Onghena, P. (2017). *Using mixed methods research synthesis for literature reviews*(2021/09/12). pp. 159–176. SAGE Publications.

Hong, Q. N., Pluye, P., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., & Vedel, I. (2018). 'Mixed Methods Appraisal Tool (MMAT), version 2018. Registration of Copyright (#1148552), Canadian Intellectual Property Office, Industry Canada.' [Online]. [Accessed on 30/03/2021] http://mixedmethodsappraisaltoolpublic.pbworks.com

Hong, Q. N., Pluye, P., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., Dagenais, P., Gagnon, M.-P., Griffiths, F., Nicolau, B., O'Cathain, A., Rousseau, M.-C., & Vedel, I. (2019). Improving the content validity of the mixed methods appraisal tool: A modified e-Delphi study. *Journal of Clinical Epidemiology*, *111*, 49–59.e1. https://doi.org/10.1016/j.jclinepi.2019.03.008

Inusa, B. P. D., Hsu, L. L., Kohli, N., Patel, A., Ominu-Evbota, K., Anie, K. A., & Atoyebi, W. (2019). Sickle cell disease—Genetics, pathophysiology, clinical presentation and treatment. *International Journal of Neonatal Screening*, *5*(2), 20. https://doi.org/10.3390/ijns5020020

Jenerette, C. M., Brewer, C. A., Silva, S., & Tanabe, P. (2016). Does attendance at a sickle cell educational conference improve clinician knowledge and attitude toward patients with sickle cell disease? *Pain Management Nursing*, *17*(3), 226–234. https://doi.org/10.1016/j.pmn.2016.05.001

Kailainathan, P., Humble, S., Dawson, H., Cameron, F., Gokani, S., & Lidder, G. (2018). A national survey of pain clinics within the United Kingdom and Ireland focusing on the multidisciplinary team and the incorporation of the extended nursing role. *British Journal of Pain*, *12*(1), 47–57. https://doi.org/10.1177/2049463717725015

Kayle, M., Brennan-Cook, J., Carter, B. M., Derouin, A. L., Silva, S. G., & Tanabe, P. (2016). Evaluation of a sickle cell disease educational website for emergency providers. *Advanced Emergency Nursing Journal*, *38*(2), 123–132. https://doi.org/10.1097/TME.0000000000000099

Khangura, S., Polisena, J., Clifford, T. J., Farrah, K., & Kamel, C. (2014). Rapid review: an emerging approach to evidence synthesis in health technology assessment. *International journal of technology assessment in health care*, *30*(1), 20–27.

Kim, S., Brathwaite, R., & Kim, O. (2017). Evidence-based practice standard care for acute pain management in adults with sickle cell disease in an urgent care center. *Quality Management in Health Care*, *26*(2), 108–115. https://doi.org/10.1097/QMH.0000000000000135

Lal, S. (2018). Integration of medical education with health-care delivery system in India for competency-based learning. *Indian Journal of Community Medicine*, *43*(4), 251–254.

Masese, R. V., Bulgin, D., Douglas, C., Shah, N., & Tanabe, P. (2019). Barriers and facilitators to care for individuals with sickle cell disease in central North Carolina: The emergency department providers' perspective. *PLoS One*, *14*(5), e0216414. https://doi.org/10.1371/journal.pone.0216414

McCambridge, J., Witton, J., & Elbourne, D. R. (2014). Systematic review of the Hawthorne effect: New concepts are needed to study research participation effects. *Journal of Clinical Epidemiology*, *67*(3), 267–277. https://doi.org/10.1016/j.jclinepi.2013.08.015

Miller, R., Coyne, E., Crowgey, E. L., Eckrich, D., Myers, J. C., Villanueva, R., Wadman, J., Jacobs-Allen, S., Gresh, R., Volchenboum, S. L., & Kolb, E. A. (2020). Implementation of a learning healthcare system for sickle cell disease. *JAMIA Open*, *3*(3), 349–359. https://doi.org/10.1093/jamiaopen/ooaa024

National Academies of Sciences, Engineering, and Medicine, Health and Medicine. (2020). *Addressing sickle cell disease: A strategic plan and blueprint for action*. The National Academic Press. https://doi.org/10.17226/25632

National Heart Lung and Blood Institute (NHLBI). (2014). *Evidence-based management of sickle cell disease: expert panel report, 2014*. [Online] [Accessed on 02/03] https://www.nhlbi.nih.gov/health-topics/evidence-based-management-sickle-cell-disease

National Institute for Care and Excellence (NICE) (2014). *Sickle cell disease – Quality standard 58 [QS58]*. [Online]. https://www.nice.org.uk/guidance/qs58/documents/nice-standard-urges-healthcare-professionals-to-improve-care-for-people-experiencing-painful-sickle-cell-episodes

NICE. (2012). Sickle cell disease: managing acute painful episodes in hospital - Clinical guideline [CG143]. [Online]. https://www.nice.org.uk/guidance/cg143

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, E., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*, n71.

Pernell, B., Nagalapuram, V., Lebensburger, J., Lin, C. P., Baskin, M. L., & Pachter, L. M. (2022). Adverse childhood experiences in children and adolescents with sickle cell disease: A retrospective cohort study. *Pediatric Blood & Cancer*, *2022*(69), e29494. https://doi.org/10.1002/pbc.29494

Po, C., Colombatti, R., Cirigliano, A., Da Dalt, L., Agosto, C., Benini, F., Zanconato, S., & Sainati, L. (2013). The management of sickle cell pain in the emergency department: a priority for health systems. *Clin J Pain*, *29*(1), 60–63.

Porter, J., Feinglass, J., Artz, N., Hafner, J., & Tanabe, P. (2012). Sickle cell disease patients' perceptions of emergency department pain management. *Journal of the National Medical Association*, *104*(9), 449–454.

Rees, P., Wohland, P., Norman, P., & Boden, P. (2011). A local analysis of ethnic group population trends and projections for the UK. *Journal of Population Research*, *28*(2–3), 149–183. https://doi.org/10.1007/s12546-011-9047-4

Sampson, F. C., Goodacre, S. W., & O'Cathain, A. (2014). Interventions to improve the management of pain in emergency departments: Systematic review and narrative synthesis. *Emergency Medicine Journal*, *31*(E1), e9–e18. https://doi.org/10.1136/emermed-2013-203079

SCTAPPG. (2018). I'm in criris' Report of the Sickle Cell and Thalassaemia All-Party Parliamentary Group (SCTAPPG) into the education of pre-registration nurses and midwives. [online] https://www.sicklecellsociety.org/wp-content/uploads/2018/11/I'm-In-Crisis-A-SCTAPPG-Report.pdf

Shapiro, B. S., Benjamin, L. J., Payne, R., & Heidrich, G. (1997). Sickle cell-related pain: Perceptions of medical practitioners. *Journal of Pain and Symptom Management*, *14*(3), 168–174. https://doi.org/10.1016/S0885-3924(97)00019-5

Sickle Cell Society. (2018). *Standards for the Clinical Care of Adults with Sickle Cell Disease in the UK*. [Online] https://www.sicklecellsociety.org/wp-content/uploads/2018/05/Standards-for-the-Clinical-Care-of-Adults-with-Sickle-Cell-in-the-UK-2018.pdf

Singh, A. P., Haywood, C. J., Beach, M. C., Guidera, M., Lanzkron, S., Valenzuela-Araujo, D., Rothman, R. E., & Dugas, A. F. (2016). Improving emergency providers' attitudes toward sickle cell patients in pain. *Journal of Pain and Symptom Management*, *51*(3), 628–632.

Telfer, P., Bahal, N., Lo, A., & Challands, J. (2014). Management of the acute painful crisis in sickle cell disease- a re-evaluation of the use of opioids in adult patients. *British Journal of Health*, *166*(2), 157–164. https://doi.org/10.1111/bjh.12879

Yacoub, M. I., Zaiton, H. I., Abdelghani, F. A., & Elshatarat, R. A. (2019). Effectiveness of an educational program on nurses' knowledge and practice in the management of acute painful crises in sickle cell disease. *The Journal of Continuing Education in Nursing*, *50*(2), 87–95.

Yaqoob, S. H., & Nasaif, H. A. (2015). Nurses' knowledge and attitudes toward pain assessment and management for adult sickle cell disease patients during sickling crisis. *Clinical Nursing Studies*, *3*(4), 36–43.

Zempsky, W. T., O'Hara, E. A., Santanelli, J. P., New, T., Smith-Whitley, K., Casella, J., & Palermo, T. M. (2014). Development and validation of the youth acute pain functional ability questionnaire (YAPFAQ). *The Journal of Pain*, *15*(12), 1319–1327. https://doi.org/10.1016/j.jpain.2014.09.008

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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