

SERVICE EVALUATION

A clinical audit of the Emergency Department: Doctors' opinions on the diagnosis and management of cervical spine radiculopathy

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Email: patriciam.mcdonnell@hse.ie**Abstract**

Objective: A clinical audit was carried out on the opinions of doctors working in the Emergency Department (ED) of a large urban hospital regarding the diagnosis and management of cervical spine radiculopathy (CSR). Using international guidelines and current research, it aimed to determine if patients attending this ED were diagnosed and managed in line with best practice, and to identify any discrepancies or areas for improvement in relation to this.

Method: Doctors working in this ED were sent an online questionnaire and descriptive analysis was performed on the results to ascertain how they diagnose and manage patients who present with symptoms of CSR. It covered; presentation and definitions of CSR, identification of red flags, clinical tests used, diagnostic test criteria, appropriate management, education and advice given, and the criteria for further management. Additionally, it looked at their opinion on the services' needs.

Results: Most agreed that CSR will improve within 4 weeks with non-operative management; however, there was a lack of consensus regarding the most affected nerve root, differential diagnosis and appropriate diagnostic tests. Opinions aligned regarding the identification of red flags and early management, especially with widespread neurological deficits. However, the management of ongoing pain or new neurological signs, differed between clinicians. Most participants strongly agreed that access to MRIs affected referrals within an ED episode.

Conclusion: Overall, the opinions matched recommended guidelines; however, some gaps in knowledge and differing management approaches were identified, indicating the need for ongoing education and standardisation of management.

KEYWORDS

cervical radiculopathy, clinical audit, emergency department, emergency room, healthcare quality, nerve root compression, nerve root disorder

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1 | INTRODUCTION

1.1 | Definition, incidence and prevalence

The North American Spine Society and The National Institute for Health and Care Excellence's (NICE) guidelines state that the term Cervical Spine Radiculopathy (CSR) is used to describe signs and symptoms in one or both upper extremities, which correlates to an irritated or compressed cervical spine nerve root resulting in pain and weakness and/or paraesthesia (Keating et al., 2019; NICE, 2023).

The prevalence of CSR has been reported as 1.21–5.8 per 1000 person years within the general population (Mansfield et al., 2020), most often affecting those between the ages of 50–54 years (NICE, 2023). The incidence within American emergency departments (ED's) is stated as 107.3/100,000 for men and 63.5/100,000 for women (Kobayashi et al., 2016). No data on the incidence and prevalence of CSR within Ireland, and specifically within Irish ED's, were found despite detailed searches of Pubmed, Cinahl and the Cochrane library.

1.2 | Guidelines on diagnosis and management

Due to the pain and disability associated with CSR, the impact on a patient's well-being can be significant. Although the prognosis for recovery is good with approximately 88% improvement within 4 weeks with conservative management (NICE, 2023), lasting pain and nerve damage can occur with CSR. The pain and sensory and motor deficits associated with these incidences of CSR, can affect a persons' function, mental health, and their ability to work and participate in society (Mansfield et al., 2020).

When a patient attends the ED, medical staff aim to identify or rule out red flags which indicate the potential presence of a serious pathology, which would require urgent referral and management to prevent or minimise serious life - changing events (Childress & Stuek, 2020). Despite rigorous searches, there was no framework or pathway found to facilitate this process in relation to CSR. For patients with Lower back pain (LBP), an International Framework for Red Flags for Potential Serious Spinal Pathologies (Finucane et al., 2020) can be used by clinicians for decision making. However the Bone and Joint Decade 2000–2010 Task Force on Neck Pain and Its Associated Disorders, have recommended the use of a similar system (McDonald et al., 2019). Although it has not been validated for the cervical spine, it is a useful tool for ED clinicians in the absence of more specific frameworks or pathways.

The NICE (2023) guidelines on the management of CSR state that clinicians must differentiate between mechanical versus neuropathic neck pain. Diagnosis is based on a detailed history and thorough medical examination including clinical tests and imaging as indicated. That is, guidelines advise combining the results from the Spurling test, Arm squeeze test, Axial traction, and upper limb neurodynamic tests to give a more accurate diagnosis of CSR. The Spurling test is carried out by performing lateral flexion, ipsilateral

rotation and compression to the patient's cervical spine. A test is positive if radicular arm pain is reproduced (NICE, 2023). The Arm squeeze test is performed by squeezing the middle third of the patient's upper arm and comparing the pain produced to that produced on compression of the acromioclavicular joint and anterolateral-subacromial areas of the symptomatic arm. A positive test is indicated when the pain score produced at the middle third is three points or higher on the visual analogue scale compared to when pressure is applied to the other two areas (Gumina et al., 2013). Concepts of specificity and sensitivity are important to consider when using these clinical tests. Specificity is the ability of a positive test result to rule a condition in, and the sensitivity is the ability of a negative test result to rule the condition out (Baeyens et al., 2019). Kang et al. (2020) support the guidelines by stating that positive results for two or more provocative tests, that is, tests which aim to reproduce the symptoms, are needed to increase the accuracy of CSR diagnosis. They found that the specificity of the Spurling test (74%–93%) and neck traction test (90%–97%) for CSR was high, with the upper limb tension tests having a high sensitivity (72%–97%). This correlates with the findings of Childress and Stuek (2020).

These objective clinical findings may be combined with imaging to confirm anatomical compromise of a nerve and guide subsequent management. However, due to the occurrence of pain without a compromised nerve root, low diagnostic accuracy of clinical tests and poor correlation between imaging results can be challenging for a clinician and need to be interpreted cautiously (Kjaer et al., 2017).

X-rays are not recommended for diagnostic purposes (NICE, 2023), but Kang et al. (2020) reported that they are an important screening tool to evaluate fractures, tumours, and degenerative pathologies. MRI is the most sensitive test for detecting soft tissue abnormalities, however it is not appropriate in initial management of acute or uncomplicated neck pain due to the high rates of abnormalities that can be seen on asymptomatic patients (Farrell et al., 2019). If MRI is contraindicated, CT myelography can be used (Blanpied et al., 2017; Bono et al., 2011; Kang et al., 2020; Malanga, 1997). Electrodiagnostic studies can be helpful; however, their timing may affect the reliability and interpretation of the results (Kang et al., 2020; Malanga, 1997).

Conservative management in the form of education on the cause of their pain, the role of analgesia, prognosis and advice to remain physically active, is recommended for those with less than four to six weeks history of symptoms. Prescribed exercises and manual therapy with a physiotherapist, should also be recommended (Bono et al., 2011; Kjaer et al., 2017; NICE, 2023). Medication based on the severity of pain, patient medical history and preferences should be given by the treating clinician, with neuropathic medication and muscle relaxants being considered (NICE, 2023). Safety netting in the form of information relating to warning signs for red flags should be given by the treating doctor with the advice to return to the ED or other health care professional should their symptoms deteriorate (Kjaer et al., 2017).

For patients with severe or progressive motor weakness or severe or progressive sensory loss, immediate specialist referral and

imaging is recommended as stated by the NICE guidelines (2023). However, if red flags are present an urgent referral on an out-patient basis may be appropriate. This is guided by the practitioner's clinical decision (NICE, 2023).

When symptoms have persisted for more than four to six weeks, the NICE guidelines and current literature recommend that an MRI is indicated with other invasive procedures, such as, interlaminar cervical epidural injections, transforaminal injections, or spinal surgery being appropriate next treatment options. Surgery may be indicated when CSR symptoms include unremitting pain persisting despite 6 to 12 weeks of conservative management, or progressive motor weakness with MRI evidence of associated nerve root compression (Childress & Stuek, 2020; NICE, 2023).

This decision-making process regarding diagnostic tests should be explained to the patient by the treating clinician for holistic management and transparency. This is particularly important as research shows that in Ireland, 31% of patients attend the ED specifically for an x-ray or scan and 23% for reassurance (Cummins et al., 2022). Therefore, the decision to refer or not to refer for imaging, and the rationale behind, it should be explained to meet the patient's needs.

1.3 | Role of clinical audits

Attendance numbers at EDs have grown worldwide. Within Ireland, where this study was conducted, ED admissions have grown by 30% in the last 10 years, increasing the demand for these services. Approximately 24% of current ED attendances are due to musculoskeletal (MSK) injuries (Cummins et al., 2022).

There is a paucity of literature regarding the appropriate pathways for the management of CSR, or the rate of adherence to the current guidelines for diagnosis and management within the ED setting. It was noted within the hospital where this study took place, that there was a discrepancy in the diagnosis and management of patients attending the ED physiotherapy service with CSR. Patients with CSR were occasionally referred with an incorrect diagnosis, or had received varying management in terms of investigations, medication, and onward referral. It has been suggested that an awareness of clinical guidelines and pressures to manage the volume and duration of ED attendances, together with patient expectations of imaging and pain management, can affect conformance to LBP guidelines within the ED (Strudwick et al., 2018). It is likely that these reasons may also apply in relation to the non-compliance of CSR guidelines. Adherence to guidelines, which are developed from a consensus on diagnosis and management following rigorous research, results in an improved process of care and patient outcomes (Pereira et al., 2022). This facilitates timely access to services with a high quality of care, that is, meeting a patient's needs with 'the right care, in the right place, at the right time', which are key focus points in Ireland's current national health policy, Slánteicare (Department of Health, 2021) and in the United Nations' Sustainable Development Goals in Population Health (Cummins et al., 2022).

To facilitate the implementation of clinical guidelines, strategies such as education sessions, audits and feedback can be effective (Pereira et al., 2022). Considering the incidence and prevalence of CSR and the high standards of healthcare targeted by national and international policies, this clinical audit will assess the current processes and practices in place, providing a valuable quality-improvement learning initiative.

1.4 | Aims

The aim of this study was to complete a clinical audit on the opinions of the doctors working in the ED of a large acute hospital in Ireland, regarding the diagnosis and management of CSR. Using the NICE clinical guidelines (NICE, 2023), the Danish nationally endorsed guidelines as recommended by Kjaer et al. (2017) and the best evidence-based practice supported by current research, this audit endeavoured to determine if patients who attend this ED with CSR would be managed in a verified, consensus-driven manner. It aimed to identify any discrepancies in the current diagnosis and management and areas for improvement in the quality of care, efficiency of care and awareness of clinical standards (Windish et al., 2021). A secondary aim was to determine if the means exist to treat these patients in line with recommended best practices, such as access to further testing, imaging, or onward referral pathways as is recommended by these guidelines, and whether they are being used by the doctors.

2 | METHODS

2.1 | Pilot

Prior to carrying out the audit, the audit questions were reviewed by a physiotherapy colleague and the researcher's MSc Dissertation supervisor for review and feedback. Amendments were made to improve the clarity of questions and information gathered. This pilot audit was then sent to the five Musculoskeletal Clinical Specialist (MCK CS) Physiotherapists working in this hospital. They gave feedback on the comprehensiveness and relevance of the questions, time for completion and flow of questions. This information was used to refine the questions to ensure that good quality information was obtained in a participant friendly manner, reducing the burden on the participants as much as possible.

2.2 | The audit

An audit was compiled in the form of an online questionnaire on the Joint Information Systems Committee (JISC) platform. This platform collected anonymised responses from participants and analysed the results. The information was stored on the secure JISC platform and accessed by the researcher via her individual JISC log in and

password. On completion of the audit, the results were exported and saved on the researcher's secure work OneDrive cloud account for the descriptive analysis of these results to be performed. Information on the JISC platform was deleted. Saved data will be retained in line with data protection guidelines.

The audit questions (Appendix A) were compiled using the recommendations from international guidelines and the findings of current research. They were focused on gaining the opinions of the participants on how they would diagnose and manage patients who presented to this ED with symptoms of CSR. The questions covered; presentation and definitions of CSR, choice of specific test when assessing for CSR, identification of red flags, differential diagnosis, diagnostic tests criteria, criteria for further management, appropriate pharmacological management, education, advice, and reassurances that should be given to the patient. It also looked at participants' view on service needs, their role within the ED and the number of years of emergency medicine experience they had. The audit questions were in a multiple-choice format and took a maximum of 7–10 min to complete. There was no identifying participant information collected during the audit.

2.3 | Participants and recruitment

The inclusion criterion for the clinical audit was any first contact practitioner within the ED who manages patients with neck or arm pain. To minimise the personal contact information accessed during this study, to facilitate anonymity and to limit the risk of coercion of participants to partake in the study, a representative doctor from each work group was identified. A work group was defined as the position the doctor held in the ED, that is, Consultants, Non-Consultant Hospital Doctors (NCHDs) and GPs. This representative was informed about the clinical audit and each verbally agreed to act as a representative for their group, facilitating the dissemination of information on, and the link for, the audit.

Once ready for dissemination, the representative doctor from each work group was contacted. They then forwarded the information about the study and the link to the JISC survey via email or WhatsApp to doctors who met the inclusion criteria. Information regarding the audit was detailed at the start of the audit and consent was received by participants selecting 'yes' at the end of the participant information page. Those who consented and completed the survey were included in the study. Potential participants had the option to not partake by not opening the survey link or by selecting 'no' to the question regarding consent which ended the survey. Participants were informed that they could withdraw consent and thus end participation at any stage of the audit, with no consequence. The contact information of the researcher and her supervisor was on the participant information page for participants to contact for further information or results if they wished. Using a representative from each workgroup minimised the researchers access to personal information and ensured that the respondent's information was anonymised. The researcher monitored the number of responses and

followed up with the representatives three times over 4 weeks, asking them to resend the message containing the link. All potential participants were contacted maximum of three times.

3 | PERMISSION

Approval to carry out this clinical audit was obtained from the hospital's Clinical Audit Co-ordinator. The ED Lead Consultant and Physiotherapy Manager were consulted, and permission was given. Ethical approval was obtained from the Queen Margaret University Research and Ethics committee.

4 | RESULTS

Of the potential 41 doctors, 22 participated in this clinical audit, resulting in a 53.7% response rate. Figure 1 shows a breakdown of the participants' years of experience. The majority (54.5%, $n = 12$) of respondents had between 1 and 5 years' experience.

Most participants ($n = 16$, 72.2%) agreed with the statement that CSR was less common than lumbar radiculopathies and almost all correctly identified the symptoms of CSR. Over half ($n = 13$, 59.1%) agreed that more than one affected nerve root was suggestive of a more widespread neurological disorder. Of the participants, 45.5% ($n = 10$) thought that 62% of patients would improve within 4 weeks, while 31.8% ($n = 7$) stated that 88% would improve within that timeframe with non-operative management. Nine doctors (42.9%) indicated that the most frequently affected nerve root was C7, with 59.1% ($n = 13$) of the opinion that C5 was the nerve root that mimicked a rotator cuff tear. Eleven of respondents (50%) chose C6 as the nerve root to most likely mimic carpal tunnel syndrome and the referral pathway for C6 nerve root involvement was identified by 63.6% ($n = 14$). However, 95.5% ($n = 21$) believed that a positive Tinel's Test or Phalen's manoeuvre was indicative of carpal tunnel syndrome. There was a 95.5% ($n = 21$) consensus that radicular pain can be caused without evident nerve compression. The Spurling tests and the Axial traction test were chosen by the majority 62.5% ($n = 10$) as tests used to help identify CSR. Most clinicians agreed which red flags should be cleared when a patient presents with neck

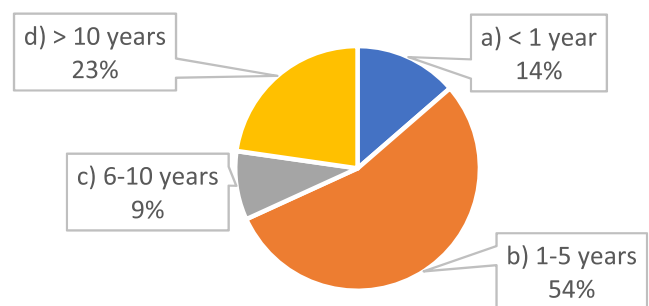


FIGURE 1 Number of years of Emergency Department (ED) experience.

and arm pain; however, only 59.1% ($n = 13$) identified cervical myelopathy as a red flag (Figure 2).

All participants agreed that an upper and lower limb neurological examination was required if a patient's presentation involved reduced manual dexterity and unsteady gait, with 95% ($n = 19$) reporting that they would request a specialist opinion within the ED if they found positive signs or symptoms of cervical myelopathy rather than CSR during their assessment. Almost all who completed this question ($n = 17-21$, 81%-100%) agreed on their role within the ED when managing a patient with CSR. The reported management and advice given for patients with pain of less than 4-6 weeks were similar for most respondents (Figures 3 and 4).

The opinions on the management of patients with more than 4-6 weeks of CSR symptoms or new objective neurological signs

varied between clinicians, with 50% ($n = 11$) electing to refer for an MRI while in the ED and 36% ($n = 8$) choosing an MRI referral as an outpatient as their management (Figure 5).

Regarding MRIs, 68.2% ($n = 15$) strongly agreed that the accessibility of, or wait time for an MRI within the ED, affects their decision to refer a patient during their ED attendance (Figure 6).

All respondents believed surgery may be applicable for patients who have severe or progressive neurological deficits with 50% ($n = 11$) of the opinion that surgery is a treatment option for those with intractable pain despite 6-12 weeks of conservative management. Finally, 68.2% ($n = 15$) reported that they strongly agreed that there was a need for a direct referral pathway from this ED to a specialist spinal service (Figure 7).

FIGURE 2 Red flags to be cleared when assessing a patient with neck pain.

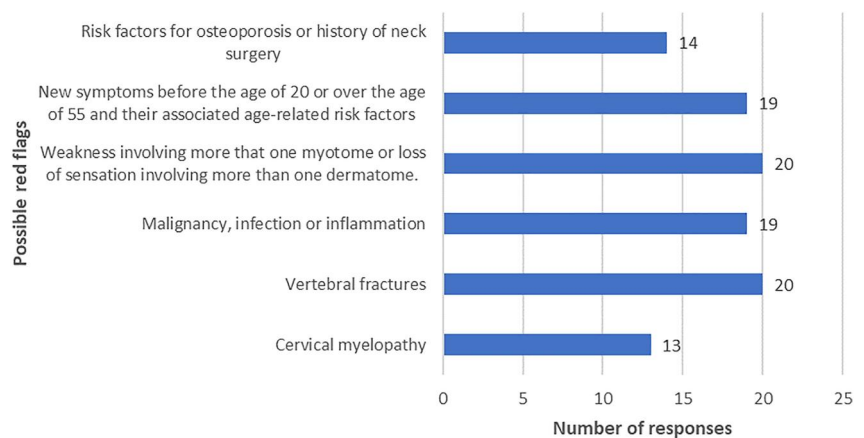


FIGURE 3 Management of neck pain of less than 4-6 weeks.

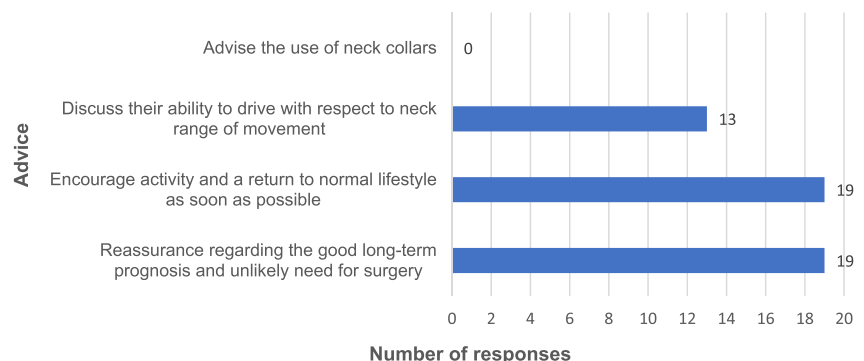
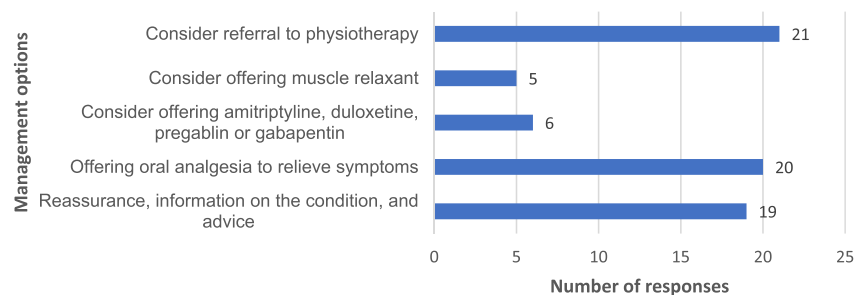


FIGURE 4 Advice given to a patient with pain for less than 4-6 weeks.

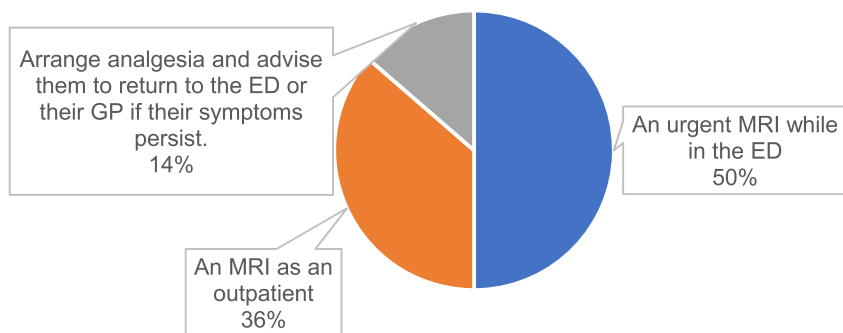


FIGURE 5 Management of patients with cervical spine radiculopathy (CSR) symptoms longer than 4–6 weeks or new objective neurological findings.

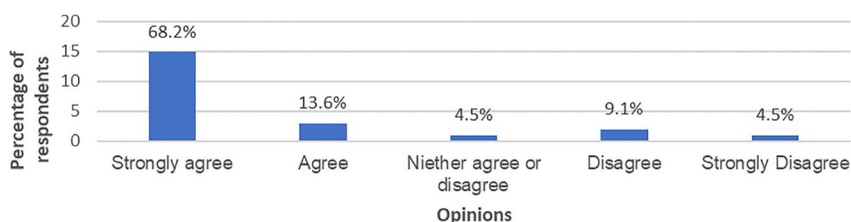


FIGURE 6 Does MRI accessibility and waiting time affect the decision to refer.

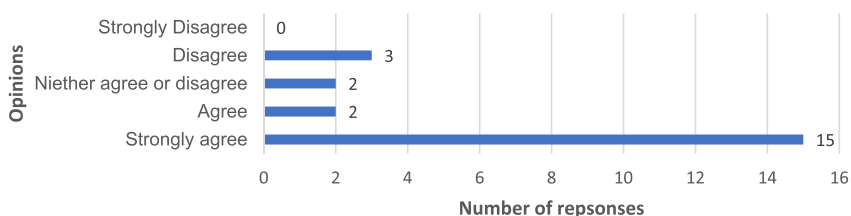


FIGURE 7 Opinions on the need for a direct referral pathway for a spinal specialist service.

5 | DISCUSSION

5.1 | Guidelines

Overall, the opinions of these ED doctors on the criteria for diagnosis of CSR align with those set out in international guidelines and published literature. The NICE guidelines, updated in April 2023, consolidate best practice guidelines published by the British Medical Journal, clinical practice guidelines from the American Physical Therapy Association (Blanpied et al., 2017) and Dutch national guidelines (Kjaer et al., 2017) with expert opinions and latest research, including that of Childress and Becker (2016) and Thoomes et al. (2021) to name but a few. The use of international guidelines and literature incorporating multiple countries, ethnicities and socioeconomic factors displays a robustness to these guidelines, making them a reliable and appropriate source to reference when looking at medical management.

5.2 | Diagnosis

Most participants correctly identified the likely presentations of CSR and agreed that its prevalence is less frequent than lumbar radiculopathies. Although the majority of participants agreed that most patients would improve after 4 weeks with non-operative

management, only 31.8% ($n = 7$) were of the opinion that this number was as high as the NICE guidelines of 88%. This suggests a gap in knowledge which should be addressed as education and reassurance is an important aspect in the management of CSR (NICE, 2023). Only 59% ($n = 13$) believed that the involvement of more than one nerve root suggested a more widespread neurological disorder, which is concerning considering the potential misdiagnosis and mismanagement as a result. Less than half of the participants correctly identified the most frequently affected nerve root, the nerve root that mimics rotator cuff tears and the nerve root that produces symptoms similar to those of carpal tunnel syndrome. Although only 50% ($n = 11$) selected C6 as a potential to mimic carpal tunnel syndrome, almost 64% ($n = 14$) knew the referral pathway for C6, with almost all knowing the clinical tests to identify carpal tunnel syndrome. Although this last discrepancy could be due to misinterpretation of the questions, it highlights a gap in knowledge as the treatment for these conditions vary and misdiagnosis could affect management. For example, a splint could be incorrectly given to a patient with C6 CSR in the case of a misdiagnosis of carpal tunnel syndrome or an onward referral to physiotherapy or orthopaedics for rotator cuff related pain, may be triaged differently to a referral for C5 CSR, affecting patient management.

Matching the international guidelines and literature on management of CSR, 96% ($n = 21$) agreed that radicular symptoms can occur without evident nerve root compression and 100% thought

that a full neurological assessment should be done on a patient presenting with symptoms of CSR, reduced manual dexterity and unsteady gait. The majority (95%, $n = 19$) correctly indicated that they would request urgent specialist review within the ED if symptoms of cervical myelopathy were present. However, only 59.1% ($n = 13$) selected cervical myelopathy and 63.6% ($n = 14$) selected risk factors for osteoporosis or a history of neck surgery as red flags to clear in a patient with symptoms of neck pain. Due to the potential catastrophic impact of cervical myelopathy, progressive radiculopathies, or spinal fractures, and the potential for incorrect management, this finding highlights another concerning gap in knowledge. Screening for these conditions prior to the onset of progressive neurological deficits is imperative and management should be commenced as early as possible to prevent lifelong disabilities (Blanpied et al., 2017; Childress & Stuek, 2020; NICE, 2023).

Diagnostic tests can be helpful in confirming or excluding conditions. International guidelines and literature state that a combination of tests is more accurate in the diagnosis of CSR. The specificity of the Spurling test and sensitivity of the Upper limb tension lead Childress and Stuek (2020) and Kang et al. (2020) to recommend their use in the diagnosis of CSR. However, their recommendation differs from the NICE (2023) guidelines, which advise a combination of the Spurling test, Axial traction test and Arm squeeze test to confirm the presence of CSR. This is likely because the NICE guidelines (2023) are based on more recent literature. In this hospital, just over 62% ($n = 10$) would use the Axial traction test and the Spurling test, showing once again that education sessions may be beneficial to review the clinical test used to improve accuracy of diagnosis.

5.3 | Management

There was an almost unanimous consensus on the role of the ED doctor and the management and advice that should be offered to patients with less than 4–6 weeks of pain, aligning with the NICE guidelines (NICE, 2023). However, only 27% ($n = 6$) and 22% ($n = 5$) would consider neuropathic medication or muscle relaxants, respectively, as part of their management. This is a recommendation of the NICE guidelines (NICE, 2023) as a treatment to consider. However, a review article by Bates et al. (2019), which contains a comprehensive algorithm on the use of neuropathic medication, highlights the difficulty in identifying neuropathic pain. As such, they emphasise the need for a detailed and thorough neurological examination to determine the presence of neuropathic pain prior to the use of these medications. Although this research was funded by the pharmaceutical company Abbott, their message regarding the need for accurate assessment and clinical decision making remains valid. Therefore, considering the phrasing of this question (Appendix A, question 16), it could be argued that the participants correctly used their clinical judgement when not selecting this as a management option. However, as the NICE guidelines state that neuropathic medication and muscle relaxants should be considered, the pros and

cons of their use should be reviewed to ensure they are considered and selected if appropriate.

When requesting imaging due to ongoing symptoms or new objective neurological signs, guidelines state that an MRI is required to confirm the diagnosis and plan for invasive procedures. However, the presence of red flags indicates the need for 'urgent' or 'immediate' assessment depending on clinical judgement. Symptoms that are of severe or progressive motor weakness, or severe or progressive sensory loss, require immediate specialist advice (Childress & Stuek, 2020; NICE, 2023). The ordering of diagnostic tests can be triggered by time constraints, doctors' preferences, and patient's expectations (Schers et al., 2000). In this ED, when symptoms are ongoing for more than four to 6 weeks or there are new objective neurological signs, there is an inconsistency in management. Some doctors (50%, $n = 11$) reported that, in this case, they would refer a patient for an MRI during their ED attendance; however, 36% ($n = 8$) believed a referral for an MRI as an outpatient was appropriate. The reason for this is likely to be multifactorial with the accessibility or waiting time for an MRI strongly agreed by 68.2% ($n = 15$) of participants as a factor in the decision to refer for an MRI during an ED attendance. The NICE guidelines (2023) and Childress and Stuek (2020) both recommend an MRI for patients with CSR for more than 4–6 weeks or with progressive neurological deficit; however, the timeline for this is not specified. These situations require clinical judgement with consideration given to severity of the symptoms as well as the potential wait time for an MRI as an outpatient and the fall-out should the symptoms progress during this wait.

The decision of when to refer to surgery, however, is unanimous when severe or progressive neurological deficits are present, following the guidelines (Kjaer et al., 2017; NICE, 2023). However, only 50% ($n = 11$) believe that it is indicated when intractable pain persists despite 6–12 weeks of conservative management, which contradicts the guidelines and current research (Childress & Stuek, 2020; NICE, 2023). Again, education may be beneficial to improve patient management.

5.4 | Access to services

The pathway for CSR in this ED is to refer a patient with red flags or worsening neurology to the Orthopaedics on-call service for an opinion whilst the patient is in the ED. Alternatively, a referral for an outpatient orthopaedic appointment can be made if indicated.

The Orthopaedic service at this hospital is not a spinal specialist service, but they assess and refer patients to a specialist spinal service, if indicated, for more invasive management such as interlaminar cervical epidural injections, transforaminal injections, or spinal surgery, which are appropriate next treatment options (NICE, 2023). Although current literature and guidelines specify the need for clinical judgement regarding urgent versus immediate referral to a spinal specialist when there is ongoing radicular pain, and immediate referral for new neurological deficits (Guzman et al., 2009; NICE, 2023), a specific

timeline or pathway is not stipulated. The multi-step process currently in place at this hospital could delay treatment and potentially affect outcomes as it may lengthen the waiting time for patients. The majority (68%, $n = 15$) of participants strongly agreed that a direct referral pathway from this ED to a spinal specialist service would be beneficial. It could address the delays in treatment currently experienced, and therefore it should be explored further. This aligns with the findings of Murphy et al. (2022), who looked at this in relation to the management of LBP in Ireland. Direct pathways streamline patient management and align with the Irish government policy, Slánteicare (Department of Health, 2021).

This audit shows that while many of the doctors within this ED are aware of and managing CSR in line with current literature and guidelines, there is a need for education sessions on CSR to improve diagnosis and standardise management. It also shows that there is a need to improve access to diagnostic investigations and spinal specialist services to manage these patients in line with evidence-based practice. Such information may be useful to policy makers who are responsible for, the funding and resources available to this ED service and developing policies to reduce the burden on already overcrowded and struggling services.

5.5 | Study limitations

There are several limitations to this study. First, this was an audit of the participants' opinions on the diagnosis and management of CSR, which may lead to a more idealised version of current practice. However, the validity of self-observation has been proven as noted by Schers et al. (2000) though this was in reference to the ordering of laboratory tests and imaging rather than diagnosis and management (Van Boven et al., 1997). To determine the exact diagnosis and management, a retrospective chart audit of patients attending the ED with neck pain would be more accurate in its findings. Second, although the response rate was significant, to extrapolate these findings and to determine trends in all EDs, a larger sample size would be needed. Thus, the findings of this audit should be limited to this site only. The timing of this survey, which was conducted in the penultimate month of the NCHD's rotations, could have influenced the results. An audit at the start of their rotation could potentially provide different results. Additionally, if we were to follow a full audit cycle, a follow-up audit should be completed once an education session on CSR is carried out. These results would allow us to gain more knowledge regarding the impact of this audit on the diagnosis and management of CSR within this ED. And finally due to the demand on the clinicians within the ED with respect to the varying types and severity of presentations and the high volume of patients attending, it is inevitable that there will be an overwhelming volume of guidelines and literature to adhere to. Therefore, it is unlikely that any audit will show total compliance and knowledge of up-to-date literature and guidelines within any possible presenting condition.

6 | CONCLUSION

This clinical audit has highlighted that most doctors working in this ED diagnose and manage patients with suspected CSR in line with international guidelines and literature, thus following best practice guidelines. However, gaps in knowledge and differing management approaches were found, indicating the need for ongoing education to update and standardise approaches. This study also shows that while there is access to services that aligns patient management to evidence-based best practice, there is a need to increase the ED doctors' access to timely diagnostic tests. The agreement amongst participants that direct access to specialist spinal services is needed shows that this should be explored further. More research is required to determine if these discrepancies and areas for improvement are site-specific, or a common finding in all EDs nationally and internationally.

AUTHOR CONTRIBUTION

Patricia McDonnell: Conceptualization (lead), Data curation (lead), Formal analysis (lead), Investigation (lead), Methodology (lead), Project administration (lead), Resources (lead), Visualization (lead), Writing – Original Draft Preparation (lead), Writing – Review & Editing (lead). **Kavi C Jagadamma:** Supervision (supporting), Validation (supporting), Writing – Review & Editing (supporting). **Prateek Rangra:** Conceptualization (supporting), Formal analysis (supporting), Methodology (supporting), Supervision (lead), Validation (lead), Writing – Review & Editing (supporting).

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

This study was conducted in accordance with the Helsinki Declaration and ethics was approved by the Queen Margaret University Research and Ethics committee on the 20 April 2023.

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APPENDIX A: AUDIT QUESTIONS

1. CSR are less frequent than lumbar radiculopathies.
 - True
 - False
2. Select the presentations below that are symptoms of CSR.
 - Pain in the neck, shoulder, or arm that approximates that of a dermatome.
 - Is usually unilateral but can be bilateral.
 - May be severe enough to wake a person at night.
 - Sensory symptoms for example, e.g. altered or absent sensation, may be present.
 - Motor symptoms for example, weakness may be present.
 - Onset can be gradual or sudden.
3. In your opinion, does the involvement of more than one nerve root suggest a more widespread neurological disorder?
 - Yes
 - No
4. In your opinion, what percentage of people with CSR will improve within 4 weeks with non-operative management?
 - 25%
 - 62%
 - 88%
5. The most frequently affected nerve root is.
 - C4
 - C5
 - C6
 - C7
6. What level of radiculopathy mimics the symptoms of a rotator cuff tear?
 - C4
 - C5
 - C6
 - C7
7. Carpal tunnel syndrome mimics a radiculopathy of which level?
 - C4
 - C5
 - C6
 - C7
8. Radicular pain is caused by compression of the nerve root but, in your opinion, can radicular symptoms occur without evident compression for example, due to inflammation?
 - Yes
 - No
9. Pain from the neck to the radial side of the bicep, dorsal web space, thumb and index finger, with or without altered biceps reflex or motor deficit of the biceps and wrist extensor, indicates which nerve root involvement?
 - C4
 - C5
 - C6
10. What could a positive Tinel's tests or Phalen's manoeuvre indicate?
 - C5 radiculopathy.
 - C6 radiculopathy.
 - Carpal Tunnel syndrome.
11. Select the Red Flags that you clear when assessing a patient with neck pain.
 - Cervical myelopathy
 - Vertebral fractures
 - Malignancy, infection or inflammation
 - Weakness involving more than one myotome or loss of sensation involving more than one dermatome.
 - New symptoms before the age of 20 or over the age of 55 and their associated age-related risk factors.
 - Risk factors for osteoporosis or history of neck pain.
12. How do you assess or manage a patient who presents with symptoms of CSR as well as reduced manual dexterity and unsteady gait?
 - Prescribe analgesia and arrange a referral to physiotherapy.
 - Perform a neurological examination of their upper and lower limbs assessing for upper or lower motor neuron changes.
13. Tests used in combination are more accurate in diagnosing certain conditions. Select which tests you perform to help identify CSR?
 - Spurling's test
 - Axial traction test
 - Arm squeeze test
 - Upper limb tension test
14. In the ED, if your assessment showed positive signs or symptoms of cervical myelopathy rather than CSR, would you:
 - Request an orthopaedic review within the ED for a specialist opinion.
 - Refer to orthopaedics for an outpatient follow-up.
 - Request that the patient's GP arrange a specialist follow-up.
 - Refer to the ED physiotherapy follow-up.
15. In your opinion, what is your role in the management of a patient who presents with CSR to the ED (select all answers that apply)
 - Assessment/identification of red flags and arranging appropriate management if necessary.
 - Pain management.
 - Advice and education regarding CSR management and expected outcomes.
 - Referral for further investigations if indicated.
 - Referral to physiotherapy.
 - Referral to GP for ongoing management as needed.
16. Currently, how do you manage a patient with neck pain of less than 4–6 weeks duration and no objective neurological findings? (Select all that apply)
 - Reassurance, information on the condition and advice.
 - Offering oral analgesia to relieve symptoms.

- Consider offering amitriptyline, duloxetine, pregabalin, or gabapentin.
 - Consider offering muscle relaxants.
 - Consider referral to physiotherapy.
17. What advice do you give to patients with pain less than 4–6 weeks? (Select appropriate answers)
- Reassurance regarding the good long-term prognosis and unlikely need for surgery.
 - Encourage activity and a return to normal lifestyle as soon as possible.
 - Discuss their ability to drive with respect to neck range of movement.
 - Advise the use of neck collars.
18. If a patient presents to the ED with CSR of more than 4–6 weeks duration, or has a new objective neurological sign do you refer them for:
- An urgent MRI while in the ED
 - An MRI as an outpatient
 - Arrange analgesia and advise them to return to the ED or to their GP if their symptoms persist.
19. Does the accessibility or waiting time for an MRI for a patient within the ED influence your decision to refer to a patient for an MRI during their ED attendance.
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
20. When would you advise that surgery may be applicable to a patient with intractable or persistent pain? (Select all that apply)
- Intractable pain despite 4 weeks of conservative management.
 - Intractable pain despite 6–12 weeks of conservative management.
 - For those who have severe or progressive neurological deficits.
21. In your opinion, do you think a direct referral pathway from this ED to a spinal specialist service is needed?
- Strongly agree
 - Agree
 - Neither agree nor disagree
 - Disagree
 - Strongly disagree
22. Please indicate your role within the ED.
- Consultant
 - Specialist Registrar
 - Registrar
 - Senior House Officer
 - Intern
 - GP
 - I'd prefer not to say
23. Please indicate your number of years' experience in emergency medicine.
- <1 year
 - 1–5 years
 - 6–10 years
 - >10 years