

BCS Editorial

## What is the effect of an interventional career on musculoskeletal health? A trainee's perspective.

*Preethi Suresh MBBS MRCP*

Cardiology Registrar (East of England)  
Norfolk and Norwich University Hospital

**Editor** Ahmed Adlan  
**Deputy Editor** Evelyn Brown

April 2023

Take Home Messages	
•	Multiple studies have shown a strong association between interventional career and orthopaedic illness.
•	Immediate measures can be taken to prevent orthopaedic injury and physicians having to take a break from the catheter lab due to a health-related issue.
•	Catheter lab staff should be given appropriate advice on core strengthening, wearing supportive shoes, shifting positions in the catheter lab, and optimizing catheter table height and positioning of screen monitors.
•	Core strength and special muscle group training as well as optimal posture training might be what will help us the most.

### Introduction

Fluoroscopically guided interventional procedures performed by cardiologists have become increasingly common and complex. These include percutaneous coronary intervention, structural interventions, pacing and catheter ablations. Given the physical demands of these interventions there is a concern for early retirement due to physical injuries in the interventional cardiology community (1). In this article, I discuss the potential deleterious effects of an interventional cardiology career on the musculoskeletal system and outline some measures to prevent injury. Musculoskeletal injury is a recognized risk in personnel staff performing fluoroscopically guided cardiovascular procedures but prevention of musculoskeletal injuries continues to be one of the areas of unmet needs in interventional cardiology.

Interventional cardiologists perform a broad range of minimally invasive procedures using imaging guidance. These techniques expose the interventionalist to a variety of occupational health concerns including radiation exposure and work-related musculoskeletal injury. We wear protective garments like lead aprons to protect ourselves from harmful radiation in the cardiac catheterization laboratory (cath lab) but it is associated with its downside. Prolonged standing, especially in cases of mechanical extraction of leads, ablations, left ventricular lead implantation and in complex percutaneous interventions such as chronic total occlusion intervention, with few opportunities for rest and poor posture can exacerbate existing back pain.

### About the author

Preethi Suresh graduated from medical school in 2015 and completed foundation and core medical training in Oxford and Yorkshire and Humber deanery respectively. She is an East of England Cardiology registrar (ST5) with a subspecialty interest in percutaneous coronary intervention. She is currently the Chair of the higher speciality training board at the East of England Deanery. Her research interests include being a sub-investigator in clinical trials investigating the management and prevention of coronary artery disease.



## Discussion

The consequences of interventional cardiology on our bones and muscles are still not well recognized. Ross *et al* (2) published in the American Journal of Cardiology back in 1997 that cardiologists reported more neck and back pain, more subsequent time lost from work, and a higher incidence of cervical disc herniations, as well as multiple level disc disease; 'interventionalist's disc disease' is a confirmed entity. Buchanan *et al* (3) conducted a "WIN for Safety" survey distributed through the European Association of Percutaneous Coronary Intervention (EAPCI) in 2012 which showed 19.5% of interventional cardiologists reported orthopaedic problems primarily back, neck and hip pain. There was an association between orthopaedic illness and years of exposure ( $p=0.001$ ).

In 2014, The Society for Catheterization and Cardiovascular Interventions (SCAI) surveyed its members and revealed that 49.4% of cardiologists complained of orthopaedic complications. This survey again demonstrated that interventionalists were more likely to report orthopaedic problems if they were older and had been in practice longer. The sub-analysis of the type of orthopaedic illnesses is shown in **Figure 1**. In addition, on sub-analysis, the total annual caseload was directly associated with reports of orthopaedic problems (4).

Orme *et al* (5) in 2015 conducted a multi-center case-control study which showed that clinical employees with occupational exposure to procedures involving radiation requiring lead apron use reported 67% increase in the prevalence of

musculoskeletal pain, compared to the control group. These employees also were more likely to have sought medical care for their pain. Female sex and increased time spent in the interventional lab wearing the lead apron were identified as major risk factors for reporting a higher incidence of pain. Andreassi *et al* (6) surveyed interventional cardiology cath lab workers in 2016 to assess the occupational health risks in cardiac cath lab workers and found that 30.2% of the staff complained of orthopaedic illness. This survey also showed a higher risk of several health problems was seen in clinical staff performing fluoroscopically guided cardiovascular procedures in comparison with unexposed individuals (7).

## Recommendation

Overall the available data, as summarized in **Table 1** (2-7) demonstrates a significant association between a career in interventional cardiology and adverse musculoskeletal health. Immediate measures need to be taken to prevent orthopaedic injury and physicians having to take a break from the cath lab due to a health-related issue. Unfortunately, there are no guidelines for preventing musculoskeletal problems whilst working in the cath lab. As shown in the surveys (2-7), years of exposure are directly proportional to orthopaedic illness, and young interventionalists must prioritize the care of their bodies and health and reduce procedural time when it is medically necessary. I have tabulated some of the measures that helped me improve my musculoskeletal health in **Figure 2**.

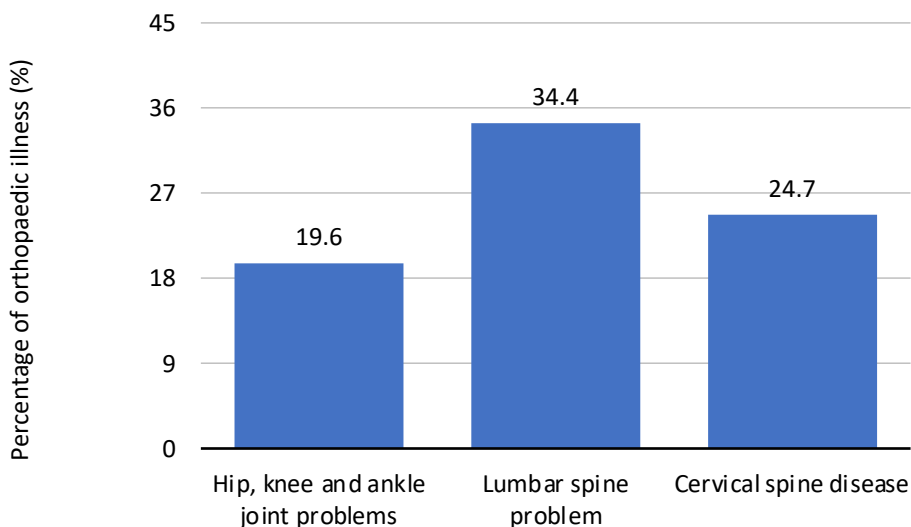


Figure 1: Sub-analysis of orthopaedic illness as per the Society for Catheterization and Cardiovascular Interventions (SCAI) survey (%) – adapted from Klein *et al* (3).

**Table 1. Summary of observational studies of musculoskeletal health in cardiac cath lab staff (2-7)**

Studies	Year	Number of participants	Findings
Ross <i>et al</i> (2)	1997	385	Interventional cardiologists experienced more musculoskeletal pain than control groups of physicians from orthopaedic surgery and rheumatology.
Goldstein <i>et al</i> The Society for Catheterization and Cardiovascular Interventions (SCAI) survey (7)	2004	424	Orthopaedic problems included spine problems in 42% of responders (of these, 70% were lumbosacral and 30% cervical). Hip, knee, or ankle problems were noted in 28% of operators.
Buchanan <i>et al</i> WIN for Safety survey (3)	2012	615	9.5% orthopaedic problems (back/neck/hip pain). An association between orthopaedic problems and years of exposure was found ( $p=0.001$ ).
Orme <i>et al</i> Mayo clinic electronic survey (5)	2013	1,543	Musculoskeletal pain varied significantly by job description, with the highest incidence reported by technicians (62%) and nurses (60%) followed by attending physicians (44%) and trainees (19%; $p < 0.001$ ).
Klein <i>et al</i> The Society for Catheterization and Cardiovascular Interventions (SCAI) survey (4)	2014	314	49.4% operators reported at least one orthopaedic injury: 24.7% cervical spine disease, 34.4% lumbar spine problems, and 19.6% hip, knee or ankle joint problems.
Andreassi <i>et al</i> Self-administered questionnaire (6)	2016	746	Orthopaedic illness ( $P<0.001$ ) is more frequently observed in workers performing fluoroscopically guided cardiovascular procedures than in unexposed controls, raising the need to spread the culture of safety in the cath lab.

Cath lab managers should consider integrating musculoskeletal health into the induction curricula of new cath lab staff and encourage regular muscle-strengthening and posture-targeting exercises. Robotic interventional equipment and remote monitoring technologies may reduce the need for wearing heavy lead aprons by reducing radiation exposure and the number of cath lab staff required

(8). For instance, advances in 3D mapping systems and intracardiac echocardiography have led to a new technique called fluoro-less ablation where the operator doesn't need to wear lead aprons which will reduce the incidence of musculoskeletal injuries (9).

**Figure 2: Measures to improve musculoskeletal health**

- Cath lab staff should be given appropriate advice on core strengthening, wearing supportive shoes, and shifting positions in the cath lab.
- The sizing of your apron is important, so make sure to choose one that is tailored to you (I prefer a two-piece apron with a blouse and kilt so that it divides the weight between the upper and lower back).
- Take time to make adjustments to the cath lab table and screen monitors. Ideally monitors should be positioned within your direct field of view to minimize excessive neck movements.
- Avoid sitting down or bending whilst wearing an apron and take a break from wearing them between each case.
- After the radial puncture, consider adducting the patient's arm fully to the side and rotating it to a neutral position making it convenient for yourself and the patient.
- Core strength and special muscle group training as well as optimal posture training to help prevent back pain.
- Therapeutic massage and alternative therapies such as yoga can be an effective means of controlling musculoskeletal pain.

There is a large body of evidence showing the prevalence of musculoskeletal injuries in interventional cardiology, however society guidelines are needed to help increase the awareness and prevention of musculoskeletal injuries especially in new trainees.

## Conclusions

The prevalence and impact of musculoskeletal health on interventional cardiology practice requires increased awareness and greater focus on prevention. Improvements in cath lab ergonomics and the development of specific cardiac society guidelines may potentially alleviate musculoskeletal symptoms and improve productivity.

## References

1. Dehmer GJ. Occupational hazards for interventional cardiologists. *Catheter Cardiovasc Interv.* 2006; 68:974–976. doi: 10.1002/ccd.21004
2. Ross AM, Segal J, Borenstein D, Jenkins E, Cho S. Prevalence of spinal disc disease among interventional cardiologists. *Am J Cardiol.* 1997;79(1):68-70. doi:10.1016/s0002-9149(96)00678-9
3. Buchanan GL, Chieffo A, Mehilli J, et al. The occupational effects of interventional cardiology: results from the WIN for Safety survey. *EuroIntervention.* 2012;8(6):658-663. doi:10.4244/EIJV8I6A103
4. Klein LW, Tra Y, Garratt KN, et al. Occupational health hazards of interventional cardiologists in the current decade: Results of the 2014 SCAI membership survey. *Catheter Cardiovasc Interv.* 2015;86(5):913-924. doi:10.1002/ccd.25927
5. Orme NM, Rihal CS, Gulati R, et al. Occupational health hazards of working in the interventional laboratory: a multisite case control study of physicians and allied staff. *J Am Coll Cardiol.* 2015;65(8):820-826. doi:10.1016/j.jacc.2014.11.056
6. Andreassi MG, Piccaluga E, Guagliumi G, Del Greco M, Gaita F, Picano E. Occupational Health Risks in Cardiac Catheterization Laboratory Workers. *Circ Cardiovasc Interv.* 2016;9(4):e003273. doi:10.1161/CIRCINTERVENTIONS.115.003273
7. Goldstein JA. Orthopedic afflictions in the interventional laboratory: tales from the working wounded. *J Am Coll Cardiol.* 2015;65(8):827-829. doi:10.1016/j.jacc.2014.12.020
8. Bonatti J, Vetrovec G, Riga C, Wazni O, Stadler P. Robotic technology in cardiovascular medicine. *Nat Rev Cardiol.* 2014;11(5):266-275. doi:10.1038/nrcardio.2014.23
9. Razminia M, Zei P. Fluoroless Catheter Ablation of Cardiac Arrhythmias: Change Is Inevitable. *J Innov Card Rhythm Manag.* 2020;11(4):4076-4078. Published 2020 Apr 15. doi:10.19102/icrm.2020.110406