

## Investigation of ergonomic techniques to prevent musculoskeletal complaints in interventional cardiology

### Invasive Cardiology

Interventional cardiology encompasses a number of different diagnostic and therapeutic strategies. Procedural times can vary from minutes to hours. Almost all procedures involve the use of ionising radiation. Prolonged standing in static positions often with poor posture (Conzett-Baumann et al, 2009) and the need to wear lead aprons places major stresses on the musculoskeletal system, especially the lower back (Fadl et al, 2007; Goldstein et al, 2004).

“Fatigue syndrome” which occurs on average after 4 hours of minimally invasive surgery has been described in the literature. Its symptoms include mental exhaustion, increased irritability, impaired judgement and reduced dexterity. (Cushieri, 1995)

A study by Ross et al (1997) compared 714 questionnaires from cardiologists, orthopaedic surgeons and rheumatologists. Cardiologists reported more neck and back pain, a higher incidence of cervical disc herniation and multiple level disc disease, and consequently more absence from work. Health care workers in invasive cardiology laboratories are equally at higher risk of spinal injuries than most other medical and surgical specialties. These findings were further corroborated by Goldstein et al (2004) who conducted an internet based survey to over 1600 cardiologists of whom 424 responded. Responders were on average busy and experienced clinicians. It was found that 28% of operators reported hip, knee or ankle problems and spinal problems were correlated to case load and years in practice. It was found interventional cardiologists commonly suffer orthopaedic disease, frequently leading to lost work days. Fadl (2007) states it is not uncommon for invasive cardiologists to require surgery or radical changes in career paths.

Efforts to improve the ergonomics of surgery, and consequently reduce error rates have resulted in the ideal surgical position to be identified. Experiments show significantly decreased error rates and tissue damage when using arm rests, with no significant increase in operation time. They also show a significant decrease on the visual analogue scale for the surgeons' perceived discomfort in their upper limbs and spine. (Galleano et al, 2006)

### Justification of project

The justification is multi-faceted that aims to improve surgical outcomes; improve health and safety; and be a cost-saving measure by

- Decreasing procedural error rate (Galleano et al, 2006)
- Decreasing the report of non-fatal injuries and illnesses (US labour statistics, 2005)
- Decreasing incidences of fatigue (Cushieri, 1995)
- Decrease in musculoskeletal work absence (Fadl et al, 2007). Current estimates for employing a locum consultant cardiologist are circa £630 / day.

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#### Areas of initial ergonomic focus

- Table height adjustment facilities
- Foot switches for high frequency surgery
- Monitor positioning and resolution
- Instrument design in particular handles and armrests
- Lead apron weight distribution
- Ergonomic awareness

(Sari et al, 2010; Park et al, 2010; Matern et al, 2001; Galleano et al, 2006, Goldstein et al 2004; Fadl et al, 2007; Ross et al, 1997)

#### Proposed tasks

- Conduct survey to ascertain need and highlight areas of interest
- Observe surgical procedures in-situ
- Specifically design equipment & produce guidelines and recommendations to meet ergonomic needs.
- Evaluation of efficiency, effectivity, health and safety, and short and long-term musculoskeletal complaint of the surgical team.

#### Team leads and structure

• Dr Todd Stewart, Senior lecturer in medical engineering, Leeds University. Position: University lead and project chairman to

○ Leeds university students, engineering and product design.

• Dr Muzahir Tayebjee. Consultant cardiologist at Leeds Hospital. Position: advisor to the team, and hospital lead for

○ Health and safety

○ Surgical staff

○ Product implementation

• Yasin Tayebjee. State registered osteopath & senior clinician at [TownOsteo.com](http://TownOsteo.com). Position:

○ Coordinating the team leads

○ Join chair to university students, advising on ergonomics and musculoskeletal matters

○ Overall responsibility for analysing needs, outcomes measures and producing reports of findings.

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